T. O. 12R3-2ARW59-2
Formerly 16-30ARW59-2

Handbook
Service Instructions

RADIO RECEIVING SET
AN/ARW-59

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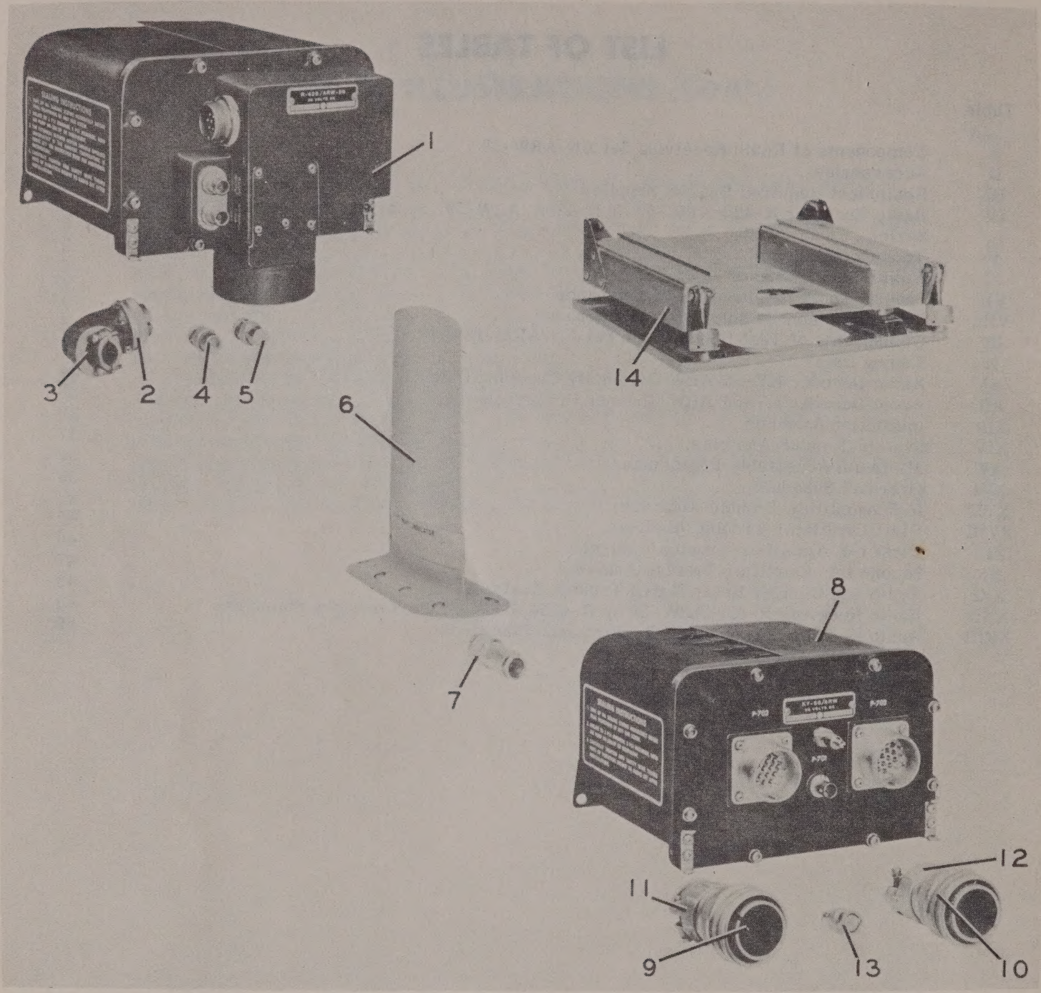


Radio Receiving Set AN/ARW-59:

1. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, which includes:
    2. Connector AN 3108B-16S-1S
    3. Cable Clamp AN 3057-8
    4. Connector UG-88/U
    5. Connector UG-88/U

Accessories:

6. Antenna AT-335/ARW, which includes:
    7. Connector UG-21B/U
8. Audio Decoder KY-55/ARW, which includes:
    9. Connector AN 3106A-22-14S
    10. Connector AN 3106A-22-14SW
    11. Cable Clamp AN 3057-12
    12. Cable Clamp AN 3057-12
    13. Connector UG-88/U
14. Mounting MT-950/ARW

Figure 1-1. Radio Receiving Set AN/ARW-59 and Accessories

SECTION I

DESCRIPTION AND LEADING PARTICULARS

1-1. PURPOSE OF HANDBOOK.

1-2. This publication provides information essential to the proper understanding of the theory of operation, the installation and the maintenance of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW by Operational / Organizational and Field /FASRON maintenance activities.

1-3. PURPOSE OF EQUIPMENT.

1-4. Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW constitute the receiving portion of a radio remote control system intended for the control of pilotless aircraft. Signals from the controlling station are received and detected to remove the r-f carrier. The audio signal thus obtained is sorted into its component tones by means of filters. Each audio tone energizes its associated relay, thus providing control for some function of the pilotless aircraft.

1-5. IDENTIFICATION OF COMPONENTS.

1-6. A composite photograph showing the external appearance of the major components constituting a complete equipment is shown in figure 1-1. Table I lists the name, Army-Navy type designation and the numerical series of reference symbols assigned to each of the major components of Radio Receiving Set AN/ARW-59.

TABLE I. COMPONENTS OF RADIO RECEIVING SET AN/ARW-59

QUANTITY PER EQUIPMENT	NAME	ARMY-NAVY TYPE DESIGNATION	NUMERICAL SERIES OF REFERENCE SYMBOLS
1	Radio Receiver	R-425/ARW-59 or R-425A/ARW-59	101-699
which includes:			
1	Connector	AN 3108B-16S-1S	P-603
2	Connector	UG-88/U	P-601, P-602
1	Cable Clamp	AN 3057-8	H-640

1-7. ADDITIONAL EQUIPMENT REQUIRED.

1-8. The equipment listed below is supplied as accessories of Radio Receiving Set AN/ARW-59. Figure 1-1 illustrates and identifies each item. When installed, the Radio Receiving Set AN/ARW-59 will be connected to and used with auxiliary equipment generally similar to that shown.

TABLE II. ACCESSORIES

QUANTITY PER EQUIPMENT	NAME	ARMY-NAVY TYPE DESIGNATION	NUMERICAL SERIES OF REFERENCE SYMBOLS
1	Antenna	AT-335/ARW	2601-2699
which includes:			
1	Connector	UG-21B/U	P-2601
1	Audio Decoder	KY-55/ARW	701-799
which includes:			
1	Connector	AN 3106A-22-14S	P-702
1	Connector	AN 3106A-22-14SW	P-703
1	Connector	UG-88/U	P-701
2	Cable Clamp	AN 3057-12	H-701
2	Mounting	MT-950/ARW	2301-2399

1-9. The following equipment is required but not supplied. Materials are generally procured by the installing group. Refer to figure 7-8, the external wiring diagram, for assistance in making up cables.

TABLE III. EQUIPMENT REQUIRED BUT NOT SUPPLIED

QUANTITY PER EQUIPMENT	NAME	DESCRIPTION OF USE
1	Adapter UG-201/U	Allows connection of UG-88/U connector to jack on Antenna AT-335/ARW
1	Connector UG-88/U	Termination for r-f cable from Antenna AT-335/ARW
As required	Cable RG-58/U	R-f and audio cables
As required	Wire, No. 22 AWG Wire, No. 16 AWG Wire, No. 14 AWG	Interconnections between units
1	Power Source	27.5 volts dc at 5 amperes

1-10. DESCRIPTION OF COMPONENTS.

1-11. RADIO RECEIVER R-425/ARW-59. Radio Receiver R-425/ARW-59 consists of six demountable, subassemblies attached rigidly to the front casting by means of an aluminum chassis. The entire component is housed within a sealed rectangular cabinet which acts as a dust cover, pressure seal, electrical shield and heat exchanger. A blower on the front casting forces air between the double walls of the metal cabinet. The air is exhausted through a vent on the top of the cabinet. The inner wall of the cabinet retains air pressure about the electrical circuitry to provide resistance to arc-over and corona at high altitudes. Internal air pressure may be checked and adjusted through use of a valve on the front casting. All electrical connections are made to three pressure-sealed connectors, J-603, J-601, and J-602. Clamps are provided to secure this component to Mounting MT-950/ARW.

1-12. The subassemblies of Radio Receiver R-425/ARW-59 are identified in figures 6-1 and 6-2. The second i-f amplifier and audio and carrier relay board are plug-in units which may be removed by the use of a Phillips head screwdriver. The other four subassemblies, the r-f amplifier, the first oscillator, the first i-f amplifier, and the dynamotor (D-601) may be removed from the chassis by unsoldering the wire leads from the connection points provided. Each subassembly is assigned a distinctive reference symbol number series. The table below lists the reference symbol series assigned to each subassembly of Radio Receiver R-425/ARW-59.

1-13. RADIO RECEIVER R-425A/ARW-59. Radio Receiver R-425A/ARW-59 is similar to Radio Receiver R-425/ARW-59 in construction and general appearance. Radio Receiver R-425A/ARW-59 differs from the other model only in the circuitry of the r-f amplifier and main chassis subassemblies. Modifications were made to these two subassemblies of Radio Receiver R-425A/ARW-59 to reduce spurious response in the 870 to 884 megacycle region and to improve the receiver operation, producibility, and reliability.

NOTE

All references to Radio Receiver R-425/ARW-59 in the following text material apply equally to Radio Receiver R-425A/ARW-59 unless otherwise specified.

TABLE IV. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59, SUBASSEMBLY REFERENCE SYMBOL SERIES

SUBASSEMBLY	REFERENCE SYMBOL SERIES
R-F Amplifier	101-199
First I-F Amplifier	201-299
Second I-F Amplifier	301-399
First Oscillator	401-499
Audio and Carrier Relay Board	501-599
Main Chassis	601-699

1-14. AUDIO DECODER KY-55/ARW. Audio Decoder KY-55/ARW is enclosed in a rectangular metal cabinet which is secured to the front casting by eight captive screws. The metal cabinet serves as a protective cover and a heat exchanger. No blowers or fans are used in this component. The heat developed by this component is conducted to the front casting and the metal cabinet and is dissipated into the surrounding air. All electrical connections are made to three pressure-sealed connectors on the front casting. The chassis is divided into two portions which are hinged to the front casting in such a manner that they may be folded out for servicing. Facilities for securing the component to Mounting MT-950/ARW are provided.

1-15. MOUNTING MT-950/ARW. Mounting MT-950/ARW consists of an aluminum chassis mounted upon four air-damped vibration isolators. The aluminum chassis is provided with clamps which permit Radio Receiver R-425/ARW-59 or Audio Decoder KY-55/ARW to be secured to the mounting. The vibration isolators are attached at their bottom ends to an aluminum plate. This plate has been provided with holes so that the mounting may be tightly secured to the aircraft.

1-16. ELECTRICAL CHARACTERISTICS.

1-17. TUBE COMPLEMENT. The symbol number, type and function of each tube of Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW are given in table V.

TABLE V. TUBE COMPLEMENT

SYMBOL NUMBER	JAN TYPE NUMBER						FUNCTION
	5840	5702	5718	5647	5639	5902	
Radio Receiver R-425/ARW-59 or R-425A/ARW-59							
V-101	1						R-F Amplifier
V-102	1						First Mixer
V-201		1					First Variable I-F Amplifier
V-202		1					Second Variable I-F Amplifier
V-203		1					Third Variable I-F Amplifier
V-204		1					Second Mixer
V-205			1				Second Oscillator
V-206			1				Second Oscillator
V-301	1						First Fixed I-F Amplifier
V-302	1						Second Fixed I-F Amplifier
V-303	1						Third Fixed I-F Amplifier
V-304	1						Fourth Fixed I-F Amplifier
V-305	1						First Limiter
V-306	1						Second Limiter
V-307				1			Discriminator
V-308				1			Discriminator
V-401			1				First Oscillator
V-402			1				First Oscillator Doubler
V-403		1					First Oscillator Tripler
V-501					1		Audio Output

TABLE V. TUBE COMPLEMENT (Cont.)

SYMBOL NUMBER	JAN TYPE NUMBER						FUNCTION
	5840	5702	5718	5647	5639	5902	
V-502			1				D-C Amplifier
V-503			1				D-C Amplifier
Audio Decoder KY-55/ARW							
V-701			1				Audio Voltage Amplifier
V-702						1	Audio Cathode Follower
V-703 thru V-712			10				Relay Amplifiers
TOTALS	8	5	17	2	1	1	

1-18. FUSE COMPLEMENT. There are no fuses in Radio Receiving Set AN/ARW-59 or Audio Decoder KY-55/ARW.

1-19. FREQUENCY COVERAGE. Radio Receiving Set AN/ARW-59 is capable of receiving signals on any of 15 integral frequency channels between 406 and 420 megacycles, inclusive.

1-20. TYPE OF RECEPTION. Frequency modulation.

1-21. SIGNALS RECOVERED FROM MODULATION. When used in its normal manner for the reception of remote control signals, the modulation recovered by Radio Receiving Set AN/ARW-59 consists of groups of the following audio tones:

7.50 kilocycles
8.46 kilocycles
9.54 kilocycles
10.76 kilocycles
12.14 kilocycles
13.70 kilocycles
15.45 kilocycles
17.43 kilocycles
19.66 kilocycles
22.17 kilocycles

These tones correspond in frequency to the resonant frequencies of the filters in Audio Decoder KY-55/ARW.

1-22. SELECTIVITY. 670 ±65 kilocycles at 6 db down. 2.2 megacycles or less at 60 db down.

1-23. SENSITIVITY. 5 microvolts or less input for 6 db signal plus noise-to-noise ratio (modulated signal plus noise-to-unmodulated signal plus noise ratio).

1-24. SPURIOUS RESPONSE. All spurious response down 60 db or more except for three which are down 50 db or more.

1-25. FREQUENCY STABILITY. Radio Receiver R-425/ARW-59: ±0.01 percent. Audio Decoder KY-55/ARW filter circuits: ±1 percent.

1-26. INPUT IMPEDANCE. Radio Receiver R-425/ARW-59: 50 ohms unbalanced. Audio Decoder KY-55/ARW: 560 ohms unbalanced.

1-27. OPERATING TEMPERATURE RANGE. -65°C (-85°F) to 70°C (158°F).

1-28. MAXIMUM ACCELERATION. Equipment will remain captive under an acceleration of 50g developed in each of six directions and sustained for 11 ±1 milliseconds.

1-29. POWER REQUIREMENTS. The following table lists the power requirements for components of Radio Receiving Set AN/ARW-59.

TABLE VI. POWER REQUIREMENTS

CIRCUIT	27.5 VOLTS DC	
	AMPERES	WATTS
Filament, Radio Receiver R-425/ARW-59	1.2	33.0
Filament, Audio Decoder KY-55/ARW	.6	18.2
Dynamotor Plate Supply, Radio Receiver R-425/ARW-59	2.3	63.3
TOTAL	4.16	114.5

1-30. DYNAMOTOR DATA.

Manufacturer: Continental Electric Company
Type: DMFX
Collins Radio Company, Part Number: 231 0056 00
Input: 27.5 V dc at 2.3 amperes
Output: 128. V dc at 205 milliamperes
Operating temperature range: -65°C (-85°F) to 105°C (221°F)

1-31. OPERATING CONTROLS.

1-32. Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW are completely controlled from a remote transmitting station. Consequently, once the equipment is properly set up and energized, no operating procedure is either necessary or possible at the receiving end. Operation of this equipment is completely described in the Handbook of Operation Instructions for Radio Transmitting Set AN/ARW-55.

1-33. ADJUSTMENT CONTROLS.

1-34. Controls are provided for setting the channel frequency and for adjusting the carrier relay closure point and audio level. The procedures for setting the CARRIER CONTROL and the AF CONTROL are given in section VI. Tuning procedures are explained in section III. Readjustment of controls should not be attempted until all the necessary test equipment has been procured.

1-35. R-F AMPLIFIER TUNING. Refer to figure 6-3. The r-f amplifier tuning control is located inside the front casting near the top of Radio Receiver R-425/ARW-59. Rotating the knob varies the capacitance of three capacitors (C-101, C-109 and C-112) thereby tuning the r-f amplifier and first mixer stages. The last two digits of the input frequency is indicated on the knob opposite the index mark on the end bearing.

1-36. FIRST I-F AMPLIFIER TUNING. Refer to figure 6-3. The first i-f amplifier tuning control consists of two knobs projecting from the first i-f amplifier subassembly on the right side of the receiver. The knobs are ganged so that rotation of one causes approximately equal rotation of the other. The knobs should be tuned to the proper position and checked for positioning individually. Detents are provided to hold the control against the effects of mechanical vibration and to facilitate positioning the control. The first i-f amplifier tuning control varies the position of a slug rack. The slug rack positions the powdered iron slugs associated with the four variable i-f amplifier tank coils and the second oscillator tank coil.

1-37. CARRIER CONTROL. Refer to figure 6-4. The CARRIER CONTROL, R-601, is located at the bottom and rear of Radio Receiver R-425/ARW-59. The control may be adjusted by means of a screwdriver to vary the bias on the first i-f amplifier stages. This operation varies the gain of the receiver. A metal collar locks the control to prevent accidental movement.

1-38. AF CONTROL. Refer to figure 6-4. The AF CONTROL, R-603, is located at the rear of Radio Receiver R-425/ARW-59. Adjustment of this control by means of a screwdriver varies the audio output level. The control may be locked by tightening the metal collar.

SECTION II
TEST EQUIPMENT AND SPECIAL TOOLS

2-1. INTRODUCTION.

2-2. The following text material lists the special tools and test equipment recommended for the maintenance, testing and trouble analysis of Radio Receiver R-425/ARW-59 or R-425A/ARW-59, and Audio Decoder KY-55/ARW. Special fixtures and cables that may be procured to expedite the work are described.

2-3. SPECIAL TOOLS.

2-4. The special tools listed in table VII are required for the maintenance and alignment of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW. The tools may be acquired individually and also as components of Test Bench Cable Set AN/ARM-15. See figure 2-1.

TABLE VII. SPECIAL TOOLS REQUIRED FOR MAINTENANCE

INDEX NUMBER	PART NUMBER	NAME	APPLICATION
1	024 0101 00	No. 8 Allen Wrench, "T" Handle	Removing front casting screws
2	505 7366 002	Tuning Wrench	Alignment tool
3	024 0019 00	No. 8 Bristo "L" Wrench	Loosening setscrews on blower rotor
4	024 9730 00	No. 6 Bristo "L" Wrench	Loosening setscrew on dynamotor fan
5	024 2900 00	No. 4 Bristo "L" Wrench	Adjusting r-f amplifier tuning mechanism
6	540 7677 002	Spanner Wrench	Removing J-603

2-5. TEST EQUIPMENT.

2-6. GENERAL. The test equipment listed in table VIII is necessary for complete servicing of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW.

TABLE VIII. TEST EQUIPMENT REQUIRED FOR MAINTENANCE

NAME	AN TYPE DESIGNATION	ALTERNATE	APPLICATION
Signal Generator	SG-50/ARW		Signal Source
Signal Generator	Boonton Model 202B		Signal Source for checking first and second i-f amplifier
"Univerter"	Boonton Model 203B		Signal Source for checking second i-f amplifier
Audio Oscillator	General Radio Model 1301A		Check audio distortion

TABLE VIII. TEST EQUIPMENT REQUIRED FOR MAINTENANCE (Cont.)

NAME	AN TYPE DESIGNATION	ALTERNATE	APPLICATION
Signal Generator	TS-382A/U		A-f signal source
Audio Coder	KY-51/ARW	None	Controlled a-f modulation for SG-50/ARW
Noise and Distortion Meter	General Radio Model 1932A		Check audio distortion
Voltmeter	TS-375/U		D-c voltage measurement
Electronic Multimeter	ME-6A/U	Ballantine 300A	A-c voltage measurement
Frequency Indicator	Berkeley Eput Meter Model 554		Calibration of audio signal source
Multimeter	TS-352/U	Simpson 260, Weston 790	Voltage and resistance measurement
Pressure Indicator Gauge	Schrader #3715		Check air pressure inside units
Air Pump	MK-20A/UP		Inflating cabinets to desired pressure
Test Bench Cable Set AN/ARM-15		See paragraph 2-7	
Power Source			180-volt d-c (55 ma) source
Power Source			Adjustable 27.5-volt d-c (5 amps) source

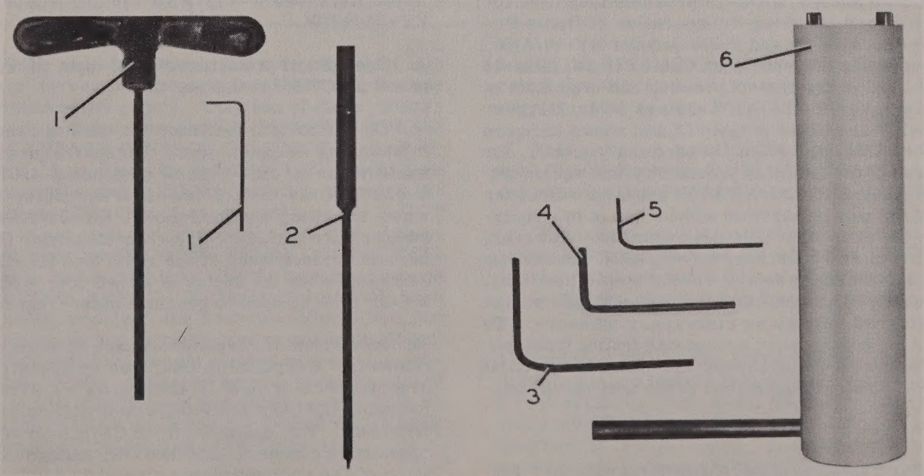


Figure 2-1. Special Tools

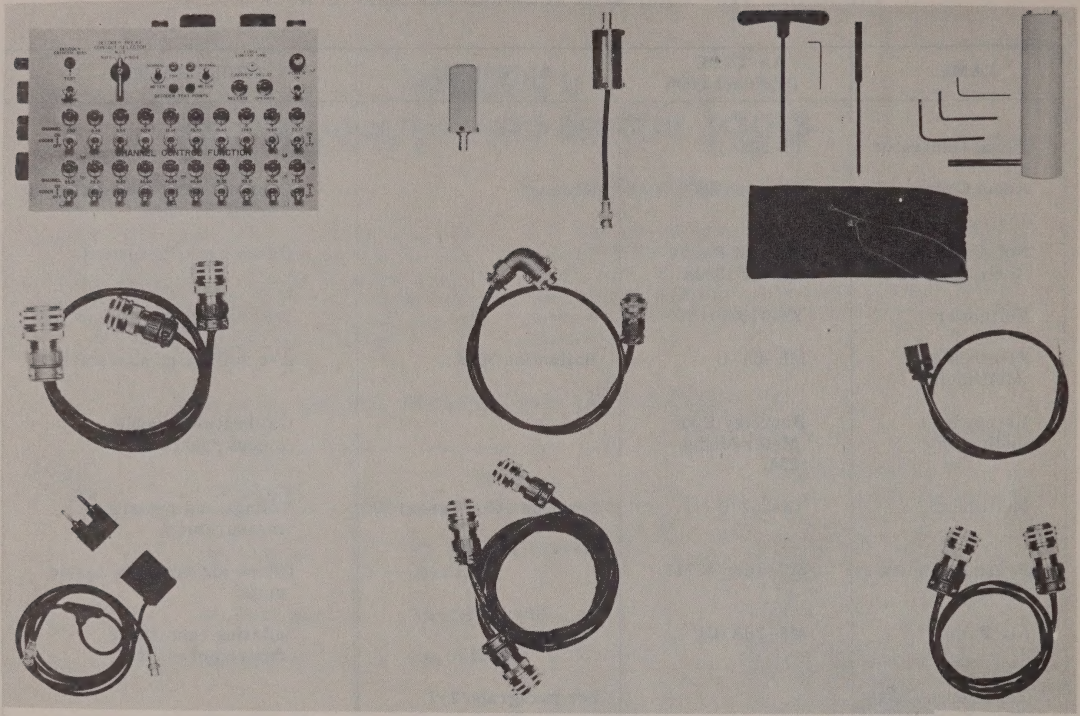


Figure 2-2. Test Bench Cable Set AN/ARM-15

2-7. TEST BENCH CABLE SET AN/ARM-15. Test Bench Cable Set AN/ARM-15 provides facilities for controlling and checking the operation of Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW. The components of Test Bench Cable Set AN/ARM-15 that are used in the control, testing and alignment of Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW are listed in table IX and shown in figure 2-2. Directions are given, in sections V and VI, for proper use of the facilities provided by this equipment. Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW may be serviced without use of this equipment in the event that it is not available. However, the testing of Audio Decoder KY-55/ARW without use of this equipment involves considerable handicap. Consequently, the substitute testing technique should be considered only as an emergency measure. To facilitate the production of a substitute testing technique, the circuitry and physical aspects of Test Bench Cable Set AN/ARM-15 are described in the next paragraph.

2-8. FUNCTIONS OF TEST BENCH CABLE SET AN/ARM-15. The functions provided by Test Bench Cable Set AN/ARM-15 are listed below. Refer to figures 2-2 and 2-3.

a. Interconnection of all units required for testing Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW.

b. Control and protection of 27.5 input power through use of a POWER switch and fuse.

c. On-off control facilities for each of twenty audio modulating frequencies. These frequencies are switched on or off by use of switches S-4301 through S-4320. Only the ten lowest frequencies are used when checking Audio Decoder KY-55/ARW. The switches are marked with a channel number (1 through 20) and the frequency of the audio tone (in kilocycles) generated when the switch is turned ON. Audio Coder KY-51/ARW is used to generate these frequencies.

d. Indication of response of each of twenty control channels. Response is indicated by operation of the proper indicator light (I-4301 through I-4320). Each indicator light is associated with a particular channel frequency. For example, if the CODER switch corresponding to channel 1 is turned ON, indication of operation of the corresponding circuit in Audio Decoder KY-55/ARW will be displayed upon the indicator light just above S-4301. This light bears reference symbol number I-4301. The DECODER RELAY CONTACT

TABLE IX. COMPONENTS OF TEST BENCH CABLE SET AN/ARM-15

ITEM NO. FIGURE 2-2	NAME	FUNCTION
1	Test Control Unit	Controlling and checking Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW
2	Dummy AF Load	Absorbs audio output of Radio Receiver R-425/ARW-59
3	AF Attenuator	Allows Audio Coder KY-51/ARW to be used as a signal source when testing Audio Decoder KY-55/ARW
4	Double Banana Plug	Connection for accessory audio equipment
5	Receiver Cable Assembly	Connects J-4301 on Test Control Unit to P-603 on Radio Receiver R-425/ARW-59
6	Decoder Cable Assembly No. 1	Connects J-4302 on Test Control Unit to Audio Decoder KY-55/ARW
7	Power Cable Assembly	Connects J-4305 on Test Control Unit to 27.5-volt dc source
8	Coder Cable Assembly No. 1	Connects J-4306 and J-4308 on Test Control Unit to J-2202 on Audio Coder KY-51/ARW
9	Coder Cable Assembly No. 2	Connects J-4307 on Test Control Unit to J-2203 on Audio Coder KY-51/ARW
10	Audio Test Cable Assembly	Connects J-602 of Radio Receiver R-425/ARW-59 to voltmeter and audio load

SELECTOR switch connects the indicator light into any one of three circuits associated with the corresponding channel frequency. Only two of these circuits are wired in Audio Decoder KY-55/ARW. With the DECODER RELAY CONTACT SELECTOR in the N.O. 2 and N.O. 6 positions the indicator light should glow when the corresponding CODER switch is moved to the ON position. The circuit associated with the N.C. 3 position is not used and there will be no indication at any time when the DECODER RELAY CONTACT SELECTOR is in this position. The position markings on the DECODER RELAY CONTACT SELECTOR have the following meaning: the first two letters (N.O. or N.C.) indicate either normally open or normally closed; the number indicates the pin number of the relay contact being checked. Normally open or normally closed refers to the condition of the relay circuit with no signal applied to Audio Decoder KY-55/ARW (CODER switch on Test Control Unit in OFF position).

e. Indication of operation of carrier relay in Radio Receiver R-425/ARW-59. The OPERATE light comes on and the RELEASE light goes out when the carrier relay closes. Opposite conditions prevail when the carrier relay is open.

f. Test jacks for metering the first limiter grid voltage of Radio Receiver R-425/ARW-59 and the filament and plate current of Audio Decoder KY-55/ARW.

g. Resistor and test jack for insertion in cathode circuits of Audio Decoder KY-55/ARW. Plate current of relay amplifier flows through this resistor (R-4321) and develops a voltage that is used as a tuning indication.

2-9. SIMULATION OF FUNCTIONS. If Test Bench Cable Set AN/ARM-15 is not immediately available, it is possible to check Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW by simulating the functions of the test setup. A study of the bench test connection diagrams and the schematic of Test Bench Cable Set AN/ARM-15 will reveal the function under test and suggest methods of performing this function.

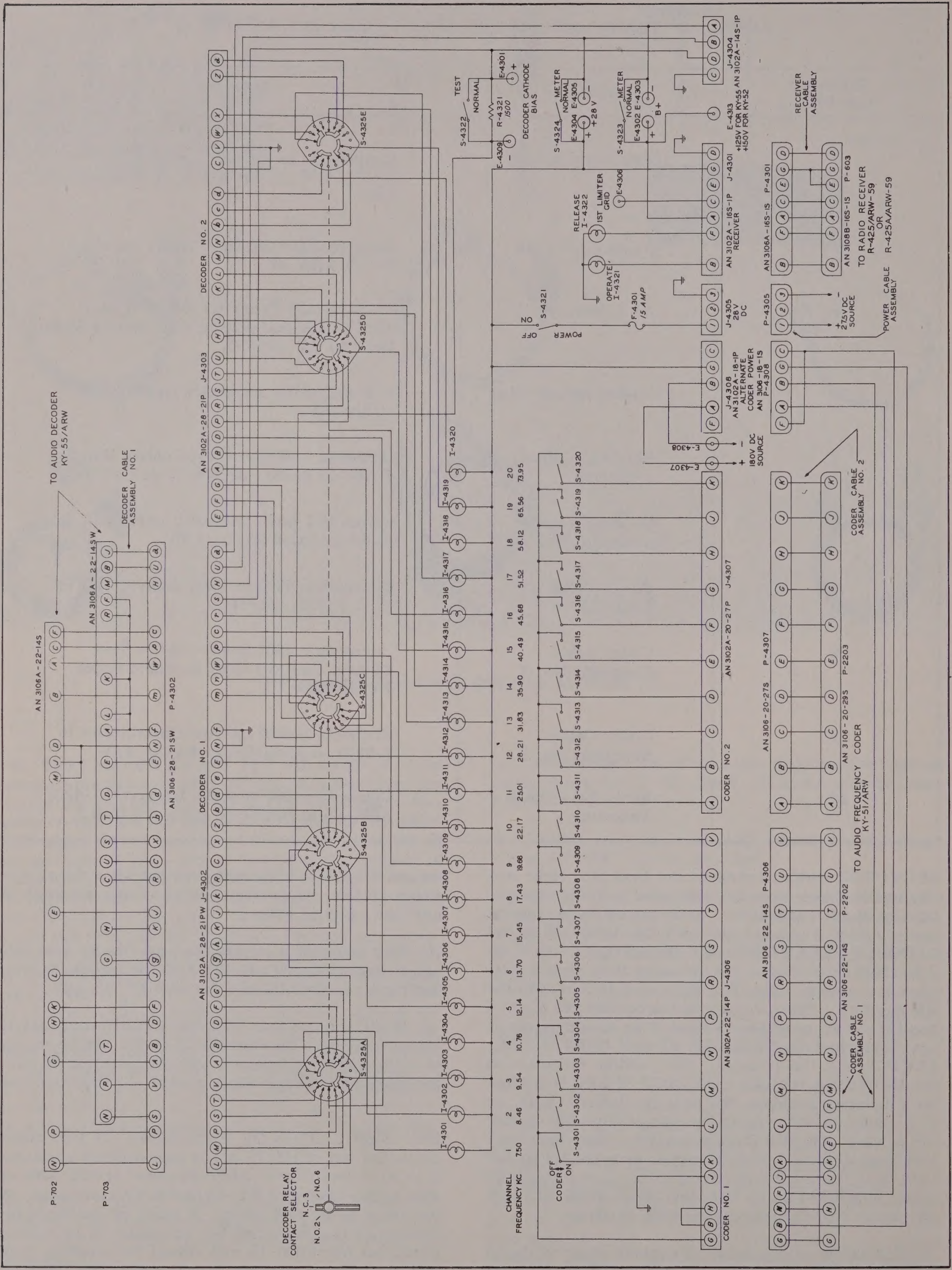

TO AUDIO DECODER KY-55/ARW
DECODER CABLE ASSEMBLY NO. 1
AN 3106A-22-14S
AN 3106A-22-14SW
AN 3106-28-21SW
P-4302
P-702
P-703
DECODER RELAY CONTACT SELECTOR
N.C.3
N.O.2
N.O.6
AN 3102A-28-21PW J-4302
DECODER NO. 1
AN 3102A-28-21P J-4303
DECODER NO. 2
S-4325A
S-4325B
S-4325C
S-4325D
S-4325E
CHANNEL
FREQUENCY KC
1 7.50
2 8.46
3 9.54
4 10.76
5 12.14
6 13.70
7 15.45
8 17.43
9 19.66
10 22.17
11 25.01
12 28.21
13 31.83
14 35.90
15 40.49
16 45.68
17 51.52
18 58.12
19 65.56
20 73.95
I-4301 … I-4320
S-4301 … S-4320
CODER OFF ON
CODER NO. 1
AN 3102A-22-14P J-4306
CODER NO. 2
AN 3102A-20-27P J-4307
AN 3106-22-14S P-4306
AN 3106-20-27S P-4307
AN 3106-22-14S P-2202
AN 3106-20-29S P-2203
TO AUDIO FREQUENCY CODER KY-51/ARW
CODER CABLE ASSEMBLY NO. 1
CODER CABLE ASSEMBLY NO. 2
E-4307
E-4308
180V DC SOURCE
J-4308
AN 3102A-18-1P
ALTERNATE CODER POWER
AN 3106-18-1S
P-4308
POWER
OFF
ON
S-4321
F-4301
15 AMP
J-4305
28V DC
P-4305
27.5V DC SOURCE
POWER CABLE ASSEMBLY
OPERATE I-4321
RELEASE I-4322
1ST LIMITER GRID
E-4306
AN 3102A-16S-1P RECEIVER
J-4301
AN 3106A-16S-1S
P-4301
AN 3108B-16S-1S
P-603
TO RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59
RECEIVER CABLE ASSEMBLY
E-4313
+125V FOR KY-55
+150V FOR KY-52
J-4304
AN 3102A-14S-1P
S-4323
METER
NORMAL
E-4302
E-4303
B+
S-4324
METER
NORMAL
E-4304
E-4305
+28V
S-4322
TEST
NORMAL
R-4321
1500
E-4309
E-4301
DECODER CATHODE BIAS

Figure 2-3. Test Bench Cable Set AN/ARM-15, Schematic Diagram

SECTION III

PREPARATION FOR USE AND RESHIPMENT

3-1. UNPACKING.

3-2. Unpack the equipment with care and check it against figure 1-1 to determine whether any components are missing. Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW are separately boxed. Check the units for signs of damage before destroying the packing material. If a claim is to be filed against the transportation agency, the packing material must be preserved for their inspection.

3-3. PREINSTALLATION BENCH TEST.

3-4. GENERAL. It is advisable to subject both Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW to a preinstallation bench test. The equipment is tested and inspected before shipment from the factory but particularly rough handling in shipment may cause defects which should be corrected before the equipment is installed.

3-5. BENCH TEST PROCEDURE. Refer to paragraphs 5-13 through 5-19 and conduct the major inspection procedure. A list of test equipment can be found in paragraph 5-15.

3-6. TUNING PROCEDURE.

3-7. GENERAL. Radio Receiver R-425/ARW-59 may be tuned to any of 15 channels, spaced 1 megacycle apart, between 406 megacycles and 420 megacycles. The cabinet of the receiver must be removed and the frequency channel set before the unit is placed in operation. The tuning procedure requires the use of Voltmeter TS-375/U and Signal Generator SG-50/ARW.

3-8. TUNING. Remove the cabinet from Radio Receiver R-425/ARW-59 by loosening eight captive screws on the front panel and sliding the cabinet rearward.

a. Tune the first i-f amplifier by rotating both first i-f amplifier tuning dials to the position indicated in table X. The first i-f amplifier tuning controls have detents which position each control accurately.

NOTE

Do not rely on cable to position controls properly. Set each knob individually to proper position.

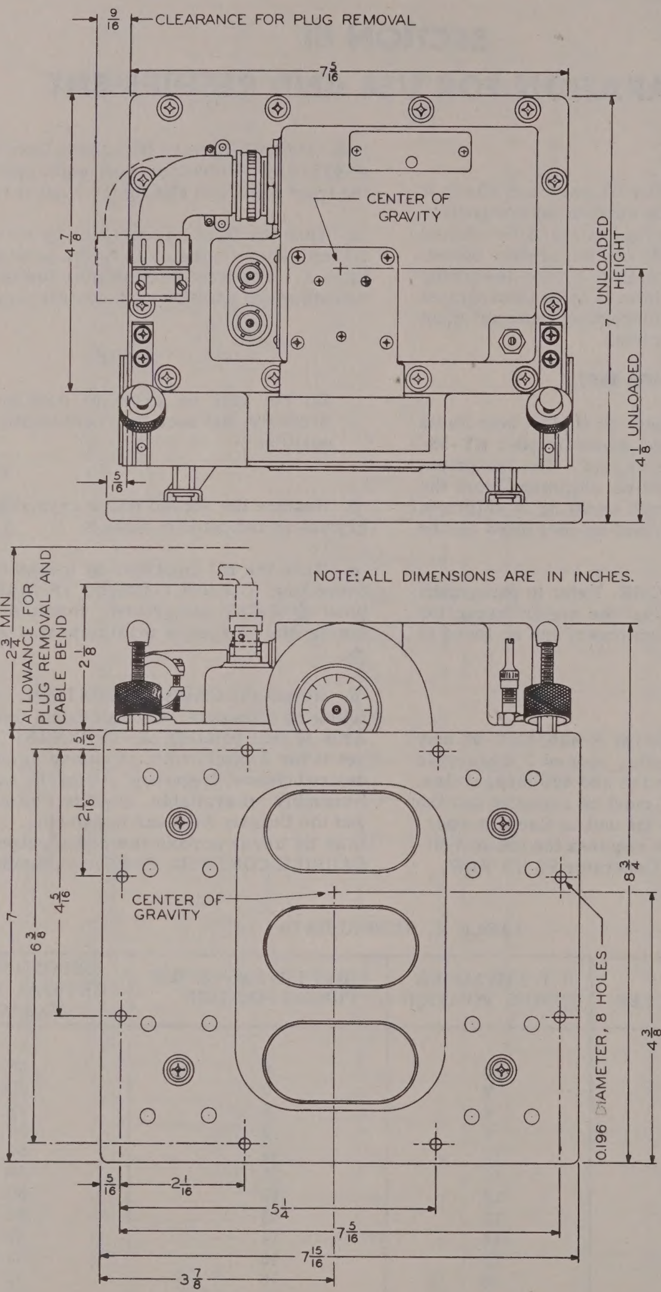
b. Replace the second mixer crystal with the proper crystal as indicated in table X.

c. Tune the r-f amplifier by means of the following procedure: Connect Voltmeter TS-375/U between test point ☆5 (J-503) and ground. Rotate the r-f amplifier tuning dial to secure maximum voltage at test point ☆5.

d. Adjust the CARRIER CONTROL by means of the following procedure: Connect Signal Generator SG-50/ARW to test point ☆1 (ANTENNA INPUT, J-601) and set it for 3 microvolts of unmodulated output at the desired channel frequency. Using the Audio Test Cable Assembly, if available, connect Voltmeter TS-375/U and the Dummy AF Load (a 560-ohm, 2-watt resistor may be used) across the audio output. Adjust the CARRIER CONTROL, R-601, to provide carrier relay

TABLE X. TUNING DATA

DESIRED INPUT FREQUENCY, MEGACYCLES	R-F AMPLIFIER TUNING POSITION	FIRST I-F AMPLIFIER TUNING POSITION	SECOND OSCILLATOR CRYSTAL FREQUENCY, MEGACYCLES
406	6	6	58.6
407	7	7	59.6
408	8	8	59.6
409	9	9	59.6
410	10	10	59.6
411	11	11	59.6
412	12	12	59.6
413	13	13	59.6
414	14	14	59.6
415	15	15	59.6
416	16	16	59.6
417	17	17	59.6
418	18	18	59.6
419	19	19	59.6
420	20	20	72.6


9/16
CLEARANCE FOR PLUG REMOVAL
7 5/16
4 7/8
CENTER OF GRAVITY
7 UNLOADED HEIGHT
4 1/8 UNLOADED
5/16
2 3/4 MIN ALLOWANCE FOR PLUG REMOVAL AND CABLE BEND
2 1/8
5/16
2 1/16
4 5/16
7
6 3/8
CENTER OF GRAVITY
8 3/4
0.196 DIAMETER, 8 HOLES
4 3/8
5/16
2 1/16
5 1/4
7 5/16
7 15/16
3 7/8

NOTE: ALL DIMENSIONS ARE IN INCHES.

TOTAL WEIGHT, MAX* 13.8 LBS*

*INCLUDES MOUNTING MT-950/ARW AND MATING CONNECTORS.
1. PLUG AN-3108B-16S-1S WITH CABLE CLAMP AN-3057-8
2. PLUGS UG-88/U

Figure 3-1. Radio Receiver R-425/ARW-59 and R-425A/ARW-59, Outline and Mounting Dimensions

closure (indicated by a sudden change of indication on Voltmeter TS-375/U) at this signal value. Tighten locking nut. The carrier relay may be adjusted to close at any value between 1 and 1000 microvolts as desired. Recommended setting is 3 microvolts.

e. Adjust the audio output value as indicated below. Check the input voltage value using Multimeter TS-352/U. Refer to figure 5-1 and find proper audio output value from the graph. Connect Signal Generator SG-50/ARW to test point ☆1 (ANTENNA INPUT, J-601) and set it for 200 microvolts output. Connect the Dummy AF Load (or 560-ohm, 2-watt resistor) and Electronic Multimeter ME-6A/U to the AUDIO OUTPUT jack using the Audio Test Cable Assembly. Apply 1000 cps modulation at 120 kilocycles deviation and adjust AF CONTROL, R-603, to secure proper audio output value.

3-9. PREPARATION FOR INSTALLATION. Disconnect all test equipment. Replace cabinet on Radio Receiver R-425/ARW-59 and temporarily tighten all captive screws. Radio Receiver R-425/ARW-59 is now ready for installation in the aircraft.

3-10. INSTALLATION PROCEDURE.

3-11. RADIO RECEIVER R-425/ARW-59 AND AUDIO DECODER KY-55/ARW. Either Radio Receiver R-425/ARW-59 or Audio Decoder KY-55/ARW is designed for installation upon Mounting MT-950/ARW. The base plate of this mounting should be approximately horizontal when the aircraft is in its normal flying attitude. The dimensions of Radio Receiver R-425/ARW-59, properly mounted upon Mounting MT-950/ARW, are shown in figure 3-1. Similar information for Audio Decoder KY-55/ARW is shown in figure 3-3. Allow approximately one inch clearance around the top of both units so that the equipment will not come into contact with the aircraft structure as it moves upon its mounting. The two mountings may each be affixed to the aircraft by use of eight number 10 machine screws or bolts.

3-12. ANTENNA AT-335/ARW. Antenna AT-335/ARW should be bolted to the skin of the aircraft by means of 8 number 12 flat head bolts. A hole must be cut in the metal skin to allow connector J-2601, on the base of the antenna, to protrude into the aircraft interior. See figure 3-2 for drilling details. A rubber gasket is supplied with Antenna AT-335/ARW to seal the antenna to the metal surface.

3-13. CABLING INSTALLED UNITS.

3-14. GENERAL. The interconnection diagram, figure 7-8, should be used when making the cables necessary for installation of this equipment. Cables may be made as desired, subject to the following restrictions:

a. Allow sufficient slack in the cables to avoid restricting movement of the equipment upon its mounting.

b. Lay all cables in positions that will reduce damage due to vibration.

c. Cables must be slack enough to permit removal and replacement of connectors without straining the cable fasteners.

d. Do not run cables over sharp edges.

e. Avoid sharp bends wherever possible.

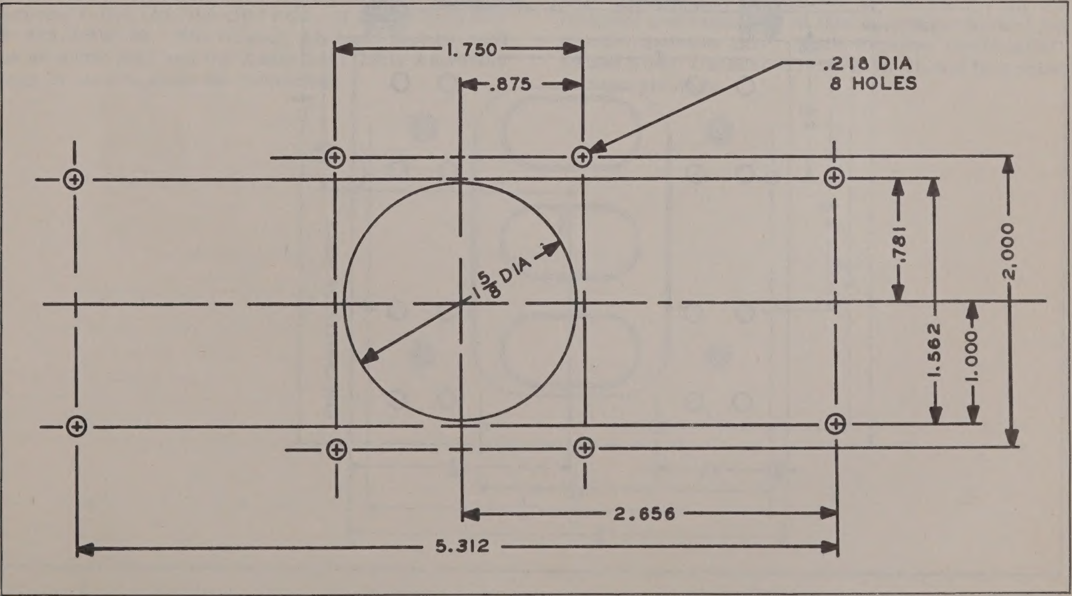
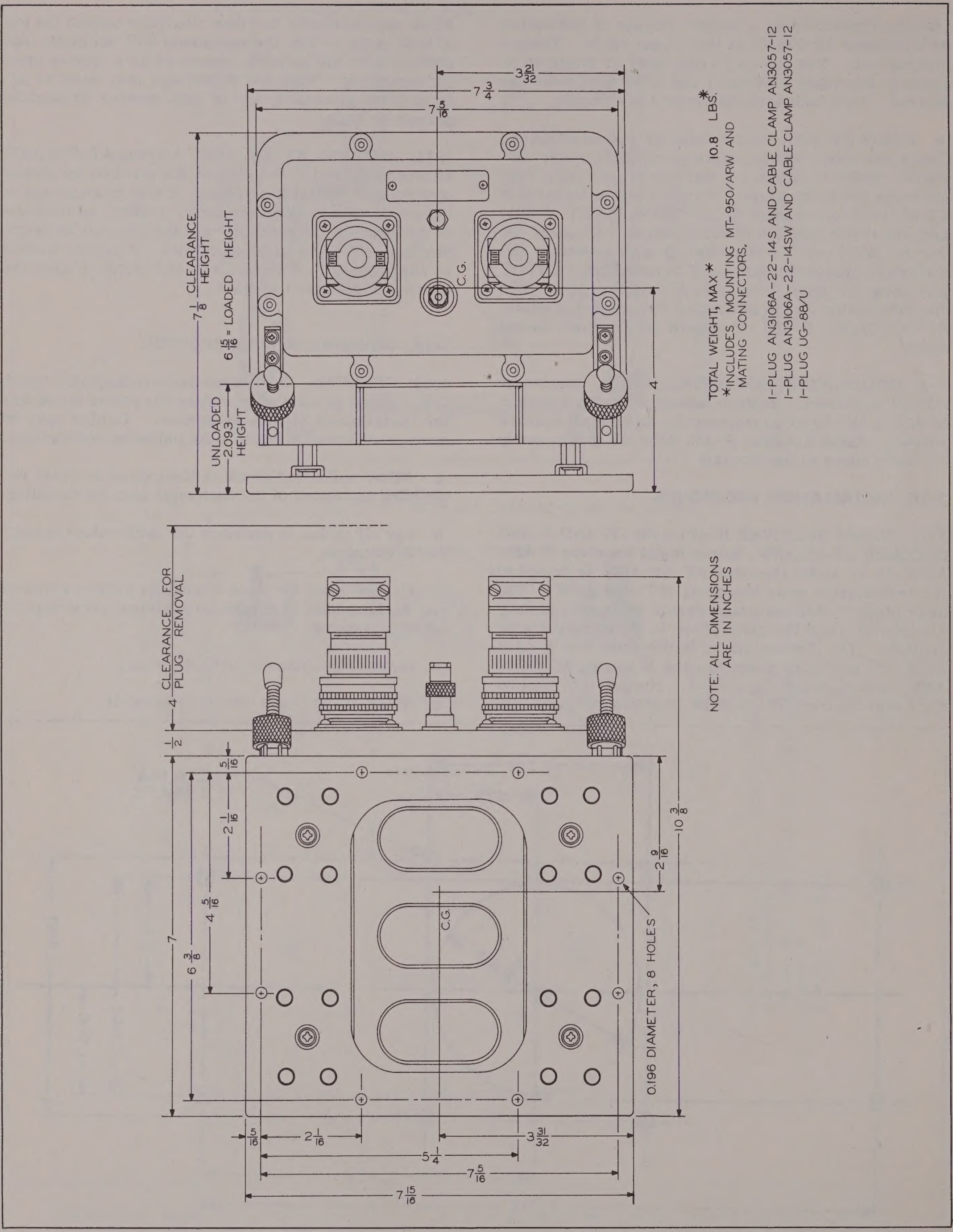


Figure 3-2. Drilling Details for Antenna AT-335/ARW


3 21/32
7 3/4
7 5/16
7 1/8 CLEARANCE HEIGHT
6 15/16 = LOADED HEIGHT
2.093 UNLOADED HEIGHT
C.G.
4
4 CLEARANCE FOR PLUG REMOVAL
1/2
5/16
2 1/16
4 5/16
6 3/8
7
2 9/16
10 3/8
C.G.
0.196 DIAMETER, 8 HOLES
5/16
2 1/16
3 31/32
5 1/4
7 5/16
7 15/16

TOTAL WEIGHT, MAX * 10.8 LBS.*

*INCLUDES MOUNTING MT-950/ARW AND MATING CONNECTORS,

1-PLUG AN3106A-22-14S AND CABLE CLAMP AN3057-12
1-PLUG AN3106A-22-14SW AND CABLE CLAMP AN3057-12
1-PLUG UG-88/U

NOTE: ALL DIMENSIONS ARE IN INCHES

Figure 3-3. Audio Decoder KY-55/ARW, Outline and Mounting Dimensions

f. Anchor the cable securely to the aircraft structure by means of cable clamps or lacing.

3-15. ON-OFF SWITCH. It may be found desirable to provide an on-off switch in the 27.5-volt supply to Radio Receiver R-425/ARW-59. The switch should be capable of breaking 10 amperes at 27.5 volts dc. If a switch is provided, it must be located between the power source and the common junction point of the input leads to Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW.

NOTE

Under no condition should a switch be placed so that it disconnects the 27.5-volt inputs of Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW. A connection between the two components prevents spurious operation of decoder circuits when the 27.5-volt power is turned off.

3-16. POSTINSTALLATION CHECK.

3-17. After the equipment has been installed it should be checked for proper operation. This is most easily done by means of the following procedure:

a. Energize the equipment by turning on the 27.5-volt power switch.

b. Energize the associated transmitting equipment. Apply the 7.50-kilocycle tone.

c. Disconnect Audio Decoder KY-55/ARW and connect a 560-ohm load and Electronic Multimeter ME-6A/U across J-602 (AUDIO OUTPUT) of Radio Receiver R-425/ARW-59. The Dummy AF Load may be used as an audio load and the Audio Test Cable Assembly may be used to make the connection.

CAUTION

Do not short center conductor of J-602 to ground when making connections.

d. Connect Voltmeter TS-375/U across the 27.5-volt input and note voltage. Voltage must be measured at input to Radio Receiving Set AN/ARW-59 to eliminate error due to voltage drop in 27.5-volt wiring.

e. Note voltage on Electronic Multimeter ME-6A/U. Compare with voltage indicated in figure 5-1. If voltage is not as shown, remove cabinet from Radio Receiver and adjust the AF CONTROL, R-603.

CAUTION

If this value is not correct the equipment may operate satisfactorily on the ground but fail when airborne.

f. Replace cabinet and pressurize Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW to 5 psi.

g. Apply various control tones at transmitting end and note response of flight control surfaces.

3-18. PREPARATION FOR RESHIPMENT.

3-19. No special procedures are necessary for the removal and repacking of this equipment beyond the use of reasonable care. Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW should be packed as separate units.

SECTION IV

THEORY OF OPERATION

4-1. INTRODUCTION.

4-2. A complete understanding of the theory of operation is essential to the effective maintenance of Radio Receiving Set AN/ARW-59. The following discussion is designed to present the maintenance technician with full knowledge of the function and method of operation of each circuit that contributes to the operation of the equipment. The discourse is divided into three steps: the presentation of the basic principles of the AN/ARW system; the tracing of the signal path through each component to correlate the various equipments; and a detailed discussion of each major circuit.

4-3. SYSTEM OPERATION.

4-4. COMPONENTS OF THE AN/ARW SYSTEM. Radio Receiving Set AN/ARW-59 is normally used as part of a complete system with Radio Transmitting Set AN/ARW-55. Included in the transmitter portion of the system are Coder Control C-615/ARW, Audio Coder KY-51/ARW, Radio Transmitter T-309/ARW-55, associated mountings, and Antenna AT-335/ARW or equivalent. The receiving portion of the system consists of Antenna AT-335/ARW or equivalent, Radio Receiver R-425/ARW-59 or R-425A/ARW-59, and Audio Decoder KY-55/ARW. Antenna AT-335/ARW and Audio Decoder KY-55/ARW are discussed in this publication as the accessories specifically designed to be used with Radio Receiver R-425/ARW-59 or R-425A/ARW-59. It is understood, however, that other components may be used if they meet equipment specifications.

NOTE

The capabilities and limits of Radio Transmitting Set AN/ARW-55 are greater than those mentioned in the following discussion. The limits stated are those capable of being utilized by Radio Receiving Set AN/ARW-59 only.

4-5. PURPOSE OF THE AN/ARW SYSTEM. The primary function of this equipment is to supply facilities for transmitting and receiving coded radio signals intended for the control of pilotless aircraft. The system of operation usually employed provides control for one aircraft at a time per transmitting station. The transmitted radio frequency carrier is frequency-modulated by combinations of audio tones. Each tone corresponds to a certain position of a flight control function of the controlled aircraft. A maximum of ten functions (20 positions) may be operated in any desired sequence but only six functions may be operated simultaneously.

4-6. GENERAL SYSTEM OPERATION. Refer to figure 4-1. An r-f carrier in the frequency range of 406-420 megacycles is generated and transmitted by Radio Transmitter T-309/ARW-55. This carrier is frequency modulated with from one to six audio tones simultaneously by Audio Coder KY-51/ARW and the modulator circuits. The operator of the transmitter Coder Control C-615/ARW selects these audio tones, as required, from a

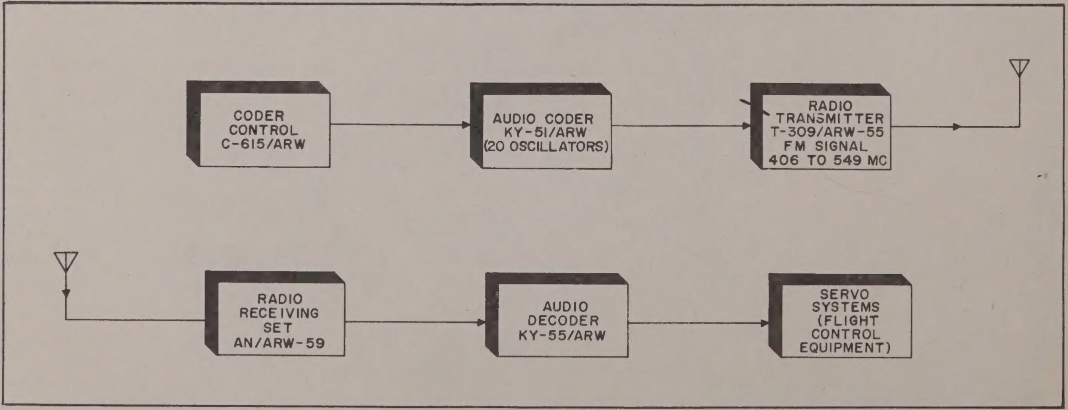

CODER CONTROL C-615/ARW
AUDIO CODER KY-51/ARW (20 OSCILLATORS)
RADIO TRANSMITTER T-309/ARW-55 FM SIGNAL 406 TO 549 MC
RADIO RECEIVING SET AN/ARW-59
AUDIO DECODER KY-55/ARW
SERVO SYSTEMS (FLIGHT CONTROL EQUIPMENT)

Figure 4-1. Radio Transmitting Set AN/ARW-55 and Radio Receiving Set AN/ARW-59, System Block Diagram

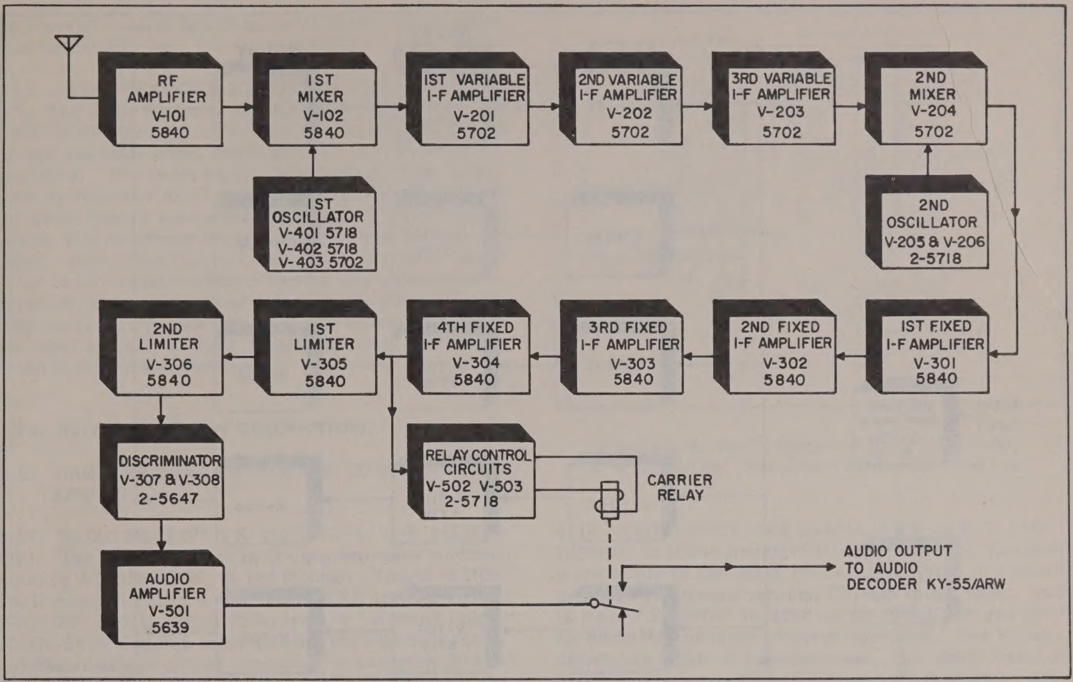

RF AMPLIFIER V-101 5840
1ST MIXER V-102 5840
1ST VARIABLE I-F AMPLIFIER V-201 5702
2ND VARIABLE I-F AMPLIFIER V-202 5702
3RD VARIABLE I-F AMPLIFIER V-203 5702
2ND MIXER V-204 5702
1ST OSCILLATOR V-401 5718 V-402 5718 V-403 5702
2ND OSCILLATOR V-205 & V-206 2-5718
2ND LIMITER V-306 5840
1ST LIMITER V-305 5840
4TH FIXED I-F AMPLIFIER V-304 5840
3RD FIXED I-F AMPLIFIER V-303 5840
2ND FIXED I-F AMPLIFIER V-302 5840
1ST FIXED I-F AMPLIFIER V-301 5840
DISCRIMINATOR V-307 & V-308 2-5647
RELAY CONTROL CIRCUITS V-502 V-503 2-5718
CARRIER RELAY
AUDIO AMPLIFIER V-501 5639
AUDIO OUTPUT TO AUDIO DECODER KY-55/ARW

Figure 4-2. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Block Diagram

53.75

register of ten possible audio tones. The frequencies of these tones are listed in paragraph 1-21.

4-7. The signal is transmitted and received by Antenna AT-335/ARW. Antenna AT-335/ARW consists of a vertical metal fin having an electrical length approximately equal to one-quarter wavelength of a 406-549 megacycle signal. This fin is mounted upon a molded polyester resin insulator which supports and insulates it from the mounting base. Antenna AT-335/ARW receives signals in the 406 to 420 megacycle range and passes them through an RG-58/U cable to the ANT connector (J-601) on Radio Receiver R-425/ARW-59 or R-425A/ARW-59.

4-8. These signals are amplified and detected in Radio Receiver R-425/ARW-59 or R-425A/ARW-59, to reproduce audio tones corresponding to the frequencies of the transmitted signal. The audio frequencies are then fed to Audio Decoder KY-55/ARW where they are further amplified and applied to relays through tuned audio filters. The relays in turn switch servo systems which operate the flight functions of the aircraft.

4-9. GENERAL THEORY OF OPERATION.

4-10. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59. Refer to figure 4-2. The input signal from the antenna is amplified by the r-f amplifier, which is tunable between 406 and 420 megacycles in 1-megacycle steps. The first oscillator crystal frequency is doubled and then tripled to produce an output of 322.50 megacycles which is fed to the first mixer. The amplified signal output of the r-f amplifier is mixed with the 322.50-megacycle first oscillator output to produce a variable intermediate frequency in the range of 83.5 to 97.5 megacycles. This intermediate frequency is amplified by three stages of tuned amplification and fed to the second mixer, where it is heterodyned with the second oscillator output. The r-f amplifier, variable i-f amplifier, and second oscillator are manually preselected for the desired channel. In this manner, the second oscillator frequency is so chosen that the resulting fixed intermediate frequency is always 24.9 megacycles. The second oscillator frequency, therefore, ranges from 58.6 to 72.6 megacycles. The fixed i-f signal is amplified by four stages of tuned amplification and fed to the first limiter and the relay control circuits. Two cascade limiter stages are incorporated at this point to limit amplitude fluctuation and noise peaks. The following discriminator stage converts the frequency modulation on the i-f signal to an a-f signal. The resulting a-f signal is amplified by the audio output stage and coupled to the input of Audio Decoder KY-55/ARW through contacts of the carrier relay. A grid bias developed by the 24.9-megacycle signal, output of the fourth i-f, is applied to the two-stage relay control circuit which operates the carrier relay. This relay opens whenever the amplitude of the received input signal drops below the level necessary for the proper operation of

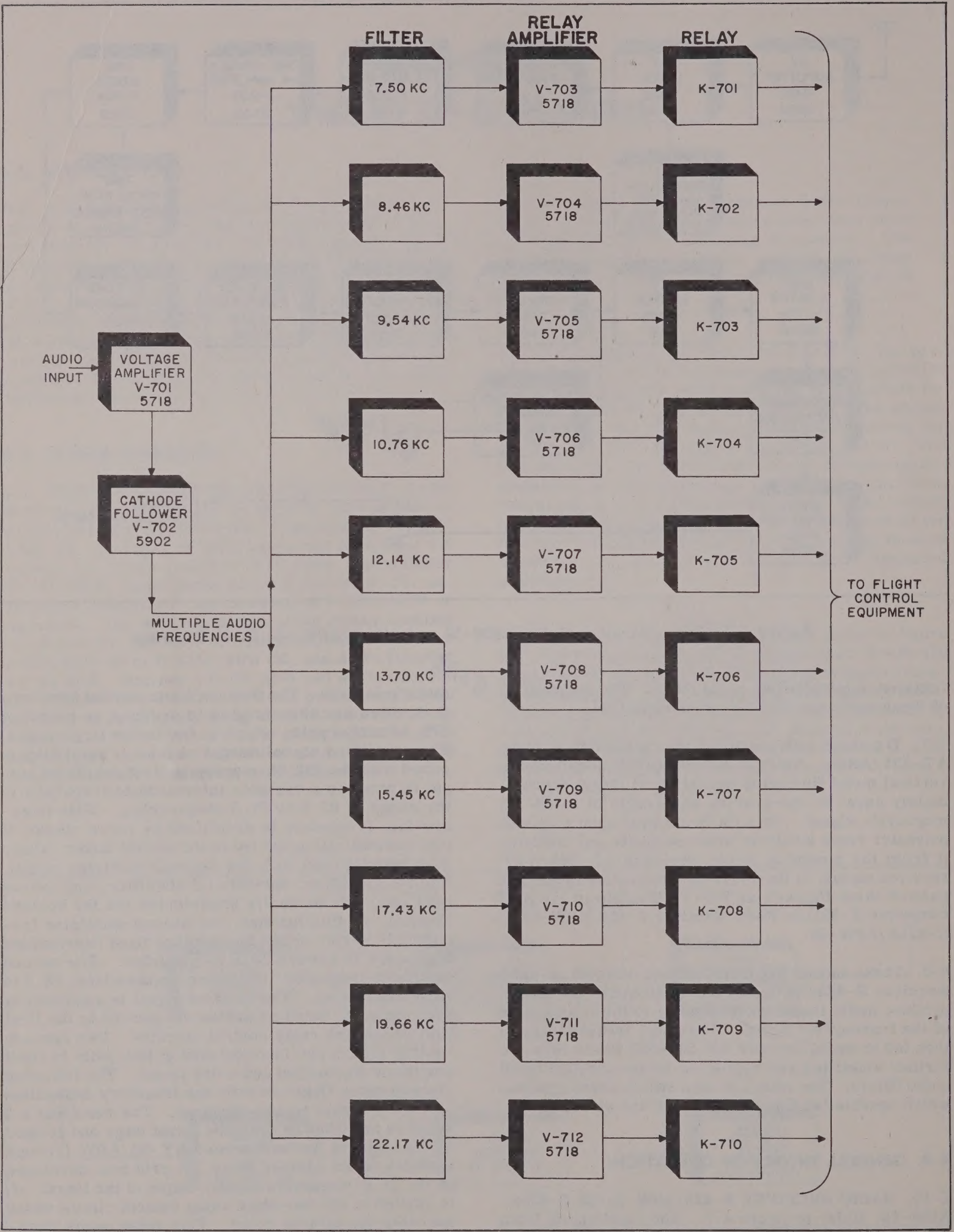

FILTER
RELAY AMPLIFIER
RELAY
AUDIO INPUT
VOLTAGE AMPLIFIER V-701 5718
CATHODE FOLLOWER V-702 5902
MULTIPLE AUDIO FREQUENCIES
7.50 KC
V-703 5718
K-701
8.46 KC
V-704 5718
K-702
9.54 KC
V-705 5718
K-703
10.76 KC
V-706 5718
K-704
12.14 KC
V-707 5718
K-705
13.70 KC
V-708 5718
K-706
15.45 KC
V-709 5718
K-707
17.43 KC
V-710 5718
K-708
19.66 KC
V-711 5718
K-709
22.17 KC
V-712 5718
K-710
TO FLIGHT CONTROL EQUIPMENT

Figure 4-3. Audio Decoder KY-55/ARW, Block Diagram

the aircraft control functions or whenever the carrier is switched off.

4-11. AUDIO DECODER KY-55/ARW. Refer to figure 4-3. The audio signal or signals from Radio Receiver R-425/ARW-59 or R-425A/ARW-59 are applied to a voltage amplifier whose output drives a cathode follower amplifier. The audio signal or signals present in the cathode follower amplifier output are fed to each of ten audio filters connected in parallel. These audio filters will pass only the frequency to which they are tuned. Each of the filters is connected to a relay amplifier and associated relay. The proper relay amplifiers and relays, associated with the audio filters whose frequencies correspond to the audio tones present in the input signal, operate, providing control directly to the flight control equipment.

4-12. DETAILED CIRCUIT DESCRIPTION.

4-13. RADIO RECEIVER R-425/ARW-59 AND R-425A/ARW-59.

4-14. RADIO RECEIVER R-425/ARW-59 R-F AMPLIFIER. The signal received by the quarter-wave antenna, Antenna AT-335/ARW, is fed through a length of RG-58/U coaxial cable to the ANTENNA INPUT CONNECTOR, J-601. Refer to figure 4-4. A short length of RG-58/U coaxial cable passes the signal through L-607 to an input circuit consisting of assembly Z-102 and associated capacitors. Assembly Z-102 consists of a "U" shaped resonant line, L-101, (see figure 4-5) with a variable capacitor, C-101, across the middle of the "U". C-101, together with capacitor C-102 (which is connected across the ends of L-101) and various other associated capacities, tune the circuit between 406 and 420 megacycles in 1-megacycle steps. The right-hand capacitor plate, figure 4-5, is affixed to a bracket which is attached to rods A and B. Rods A and B are manipulated by the r-f amplifier tuning dial. Consequently, the r-f tuning dial controls the spacing of the plates of C-101, thereby controlling the capacitance of C-101 and the resonant frequency of the input tank circuit. Capacitors C-125, C-128, C-103, the grid to ground capacity of V-101, and the inductance of Z-102, constitute a low pass pi-network. Inductor L-102 is a static drain choke. Resistor R-101 is the grid resistor for V-101. Operating bias for V-101 is obtained from the voltage drop across cathode resistor R-102. The cathode and suppressor grid are maintained at an a-c ground potential by means of capacitors C-105 and C-106 which offer a low reactance to r-f signals. Screen dropping resistor R-110 is bypassed by C-116.

4-15. The amplified output of V-101 appears across Z-103 and is inductively coupled by L-104 to a resonant circuit consisting of Z-104 (refer to figure 4-8) and associated capacities. The construction of Z-103 and Z-104 is similar to that of Z-102. The parallel resonant circuits consisting of Z-103 and Z-104 and their associated capacities, are tuned to the r-f input frequency and are critically coupled by L-104. Capacitors C-129, C-110, C-114, and C-132 are used to trim their associated tank circuits. Capacitors C-116, C-111, C-130, and choke L-107 decouple r-f from the B-plus line.

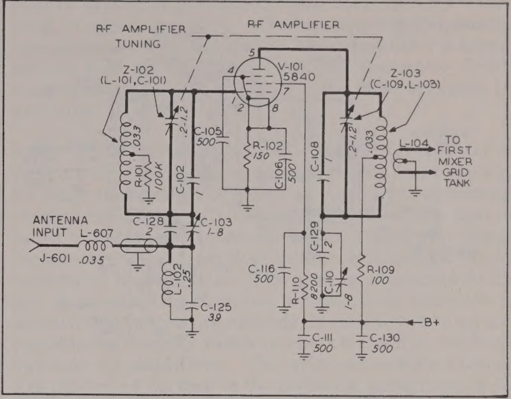


Figure 4-4. Radio Receiver R-425/ARW-59, R-F Amplifier, Simplified Schematic Diagram

4-16. RADIO RECEIVER R-425A/ARW-59 R-F AMPLIFIER. In Radio Receiver R-425A/ARW-59, changes were made in the main chassis assembly to reduce spurious responses between 870-884 megacycles, and in the r-f amplifier to improve the reliability and performance of complete receiver operation. Due to subassembly type of construction, the units remain electrically and mechanically interchangeable. The following discussion covers the circuit changes and theory of operation involved. Refer to figure 4-6.

4-17. In Radio Receiver R-425A/ARW-59, L-607, located in the input lead, is replaced by W-601. W-601 is an open quarter-wave stub resonant at approximately

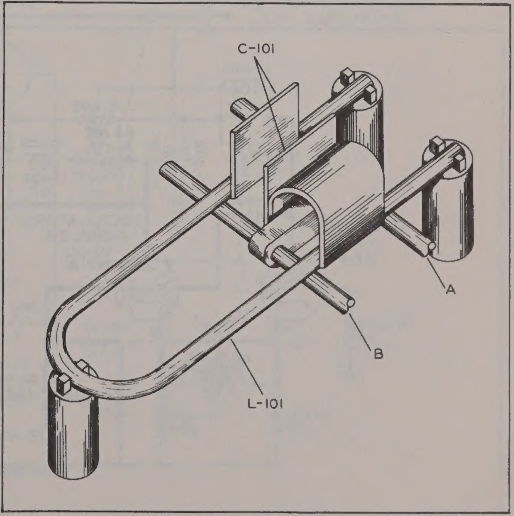


Figure 4-5. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Construction of Z-102

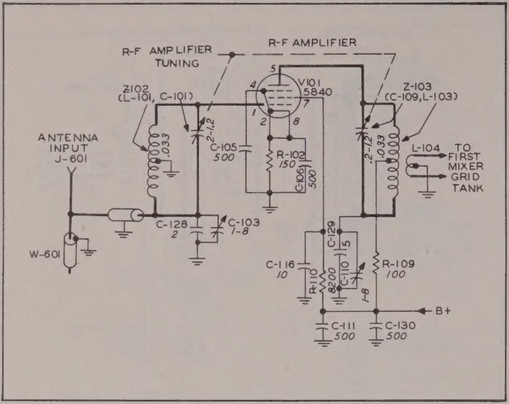

R-F AMPLIFIER TUNING
R-F AMPLIFIER
Z102 (L-101, C-101)
V101 5840
Z-103 (C-109, L-103)
ANTENNA INPUT J-601
.033
2-12
C-105 500
R-102 150
C-106 500
L-104 TO FIRST MIXER GRID TANK
C-128 2
C-103 1-8
W-601
C-116 10
R-110 8200
C-129
C-110 1.5
1-8
R-109 100
B+
C-111 500
C-130 500

Figure 4-6. Radio Receiver R-425A/ARW-59, R-F Amplifier, Simplified Schematic Diagram

877 megacycles. This tends to increase spurious rejection between 870 and 884 megacycles. The shield of the input cable between the antenna input and the r-f amplifier, is grounded at midpoint to reduce a spurious frequency resonant between 800 and 900 megacycles. The input coupling is changed from a capacitor divider type input to a direct tap on the tank, resulting in autotransformer action. This improves the input impedance match and permits the deletion of L-102, C-125, and R-101. By removing C-102 and C-108, and moving the r-f ground points on the "U" shaped tanks to a more suitable position, the gain of the r-f amplifier is further stabilized. This necessitates changing the value of C-113 from 0.5 micromicrofarads to 1.0 micromicrofarads. Additional bypassing of the screen circuit is accomplished by changing the value of C-116 from 500 micromicrofarads to 10 micromicrofarads, resulting in a series resonant condition for the screen lead.

NOTE

The following text applies equally to Radio Receiver R-425/ARW-59 and R-425A/ARW-59 unless otherwise specified.

4-18. FIRST OSCILLATOR CIRCUITS. Refer to figure 4-7. The first oscillator consists of a grounded grid amplifier, V-401, a frequency doubler stage, V-402, and a frequency tripler stage, V-403, connected in cascade. The grounded grid amplifier and the frequency doubler stage form a Butler oscillator circuit. The grounded grid amplifier, V-401, amplifies random noise voltages and applies them to the plate tank comprised of L-401 and C-401. This plate tank attenuates all frequencies differing from its resonant frequency (53.75 megacycles). Consequently, the signal coupled to V-402 through C-403 consists largely of a 53.75-megacycle signal. This signal appears as an amplified signal in the plate circuit of V-402. V-402, however, also acts as a cathode follower and the signal at the cathode of V-402 is fed back to the cathode of V-401 through crystal Y-401. The crystal operates at its resonant fundamental frequency thereby supplying feedback of the proper frequency and phase to maintain the 53.75-megacycle oscillation in V-401. A combination tank circuit and frequency trap comprised of L-405, C-404, and C-405, is connected into the plate circuit of V-402. The over-all tank circuit is tuned to the second harmonic of the oscillator or 107.5 megacycles. This frequency is passed by the tank circuit with negligible attenuation and is coupled by C-408 to the grid of V-403. Inductor L-405 and capacitor C-404

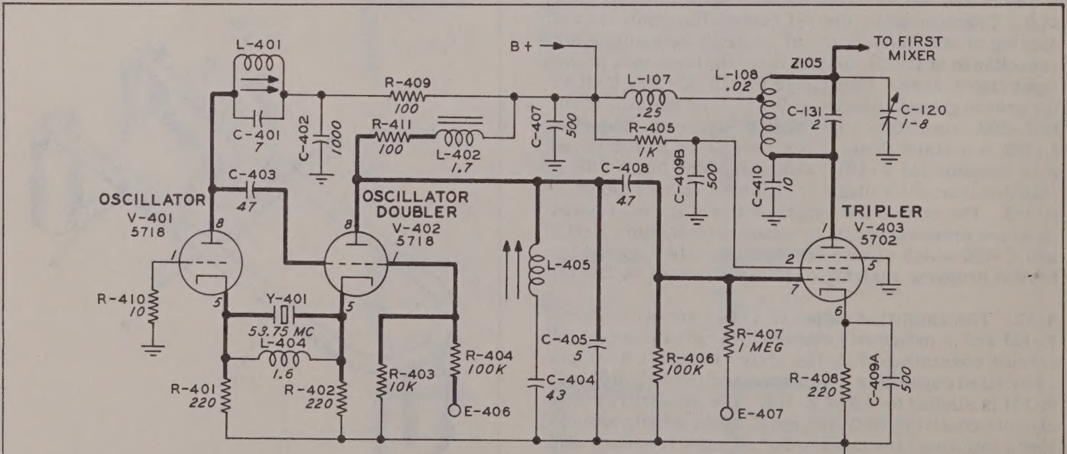

L-401
R-409 100
R-411 100
L-402 1.7
C-401 7
C-402 1000
C-403 47
B+
C-407 500
L-107 .25
L-108 .02
Z105
TO FIRST MIXER
C-131 2
C-120 1-8
R-405 1K
C-408 47
C-409B 500
C-410 10
OSCILLATOR V-401 5718
OSCILLATOR DOUBLER V-402 5718
TRIPLER V-403 5702
R-410 10
Y-401 53.75 MC
L-404 1.6
L-405
C-405 5
C-404 43
R-401 220
R-402 220
R-403 10K
R-404 100K
E-406
R-406 100K
R-407 1 MEG
E-407
R-408 220
C-409A 500

Figure 4-7. First Oscillator Circuit, Simplified Schematic Diagram

are tuned to series resonance at 53.75 megacycles. This provides a low impedance path to ground for the oscillator fundamental frequency. The 107.5-megacycle signal is amplified by the tripler stage, V-403, and applied to the plate tank, C-108, C-131, and C-120. The plate tank is tuned to 322.5 megacycles, the third harmonic of the 107.5-megacycle input signal. Sufficient third harmonic energy is present to drive the first mixer grid. Other frequencies present in the output of V-403 are attenuated. Variable inductors L-401 and L-405 are used in tuning the plate tanks of V-401 and V-402, respectively. Capacitor C-120 is used in tuning the tripler tank to resonance at 322.5 megacycles. The components of the tripler tank of V-403 are mounted in the r-f amplifier subassembly. The signal is coupled to the grid of V-102 by capacitor C-115.

4-19. FIRST MIXER. Refer to figure 4-8. The r-f signal output of the r-f amplifier is coupled through C-127 to the grid of the first mixer, V-102, where it is heterodyned with the 322.5-megacycle output of the first oscillator. Since the r-f amplifier frequency ranges from 406 to 420 megacycles, an intermediate frequency in the range of 83.5 to 97.5 megacycles is produced. The two amplified injection signals, and the intermediate frequency at the plate of V-102, are fed to L-201 and C-201, the mixer plate tank. This tank is tuned to resonance at the intermediate frequency through the use of the first i-f amplifier manual tuning control. Resistor R-201 broadens the band-pass characteristic of this tank so that the relatively wide-band i-f signal may pass. The two injection frequencies are attenuated by the mixer tank, but the i-f signal passes with negligible attenuation. Capacitor C-204 couples the signal to the grid of the first variable i-f amplifier, V-201.

4-20. FIRST VARIABLE I-F AMPLIFIER. Refer to figure 4-9. The signal at the grid of the first variable i-f stage is amplified by V-201 and applied to a resonant circuit consisting of L-202 and C-208. This tank is tuned to resonance at the variable i-f amplifier signal frequency, thus providing further attenuation for all undesired frequencies. The grid is connected to the avc line which is common for all three variable i-f amplifiers, while the cathode is connected to an adjustable bias supply which is also common to the three variable i-f amplifiers. The grid and cathode circuits are discussed further in the following paragraph, 4-21. Resistor R-233 and capacitor C-212 are used for parasitic suppression and screen decoupling. The band pass of the plate tank circuit of V-201 is sufficiently broadened by R-206 to permit the i-f signal to pass. C-247 is a temperature compensating capacitor, as are C-244 and C-245 in the second and third variable i-f amplifiers. Capacitor C-211 couples the i-f signal to the grid of the second variable i-f amplifier.

4-21. SECOND AND THIRD VARIABLE I-F AMPLIFIERS. Refer to figure 4-10. The second and third variable i-f amplifiers, V-202 and V-203, are identical

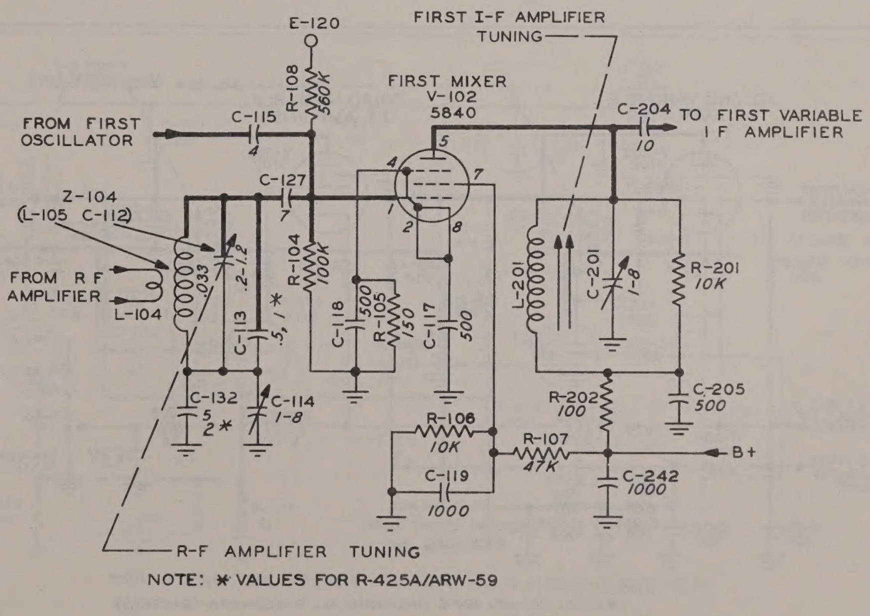
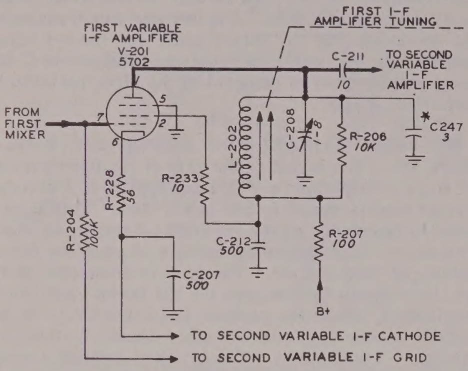

E-120
FIRST I-F AMPLIFIER TUNING
FIRST MIXER
V-102
5840
C-204
10
TO FIRST VARIABLE I F AMPLIFIER
R-108
560K
FROM FIRST OSCILLATOR
C-115
4
C-127
7
Z-104
(L-105 C-112)
FROM R F AMPLIFIER
L-104
.033
.2-1.2
C-113
.5, 1 *
R-104
100K
C-118
500
R-105
150
C-117
500
L-201
C-201
1-8
R-201
10K
C-132
5
2 *
C-114
1-8
R-106
10K
C-119
1000
R-107
47K
R-202
100
C-205
500
C-242
1000
B+
R-F AMPLIFIER TUNING
NOTE: * VALUES FOR R-425A/ARW-59

Figure 4-8. First Mixer Circuit, Simplified Schematic Diagram

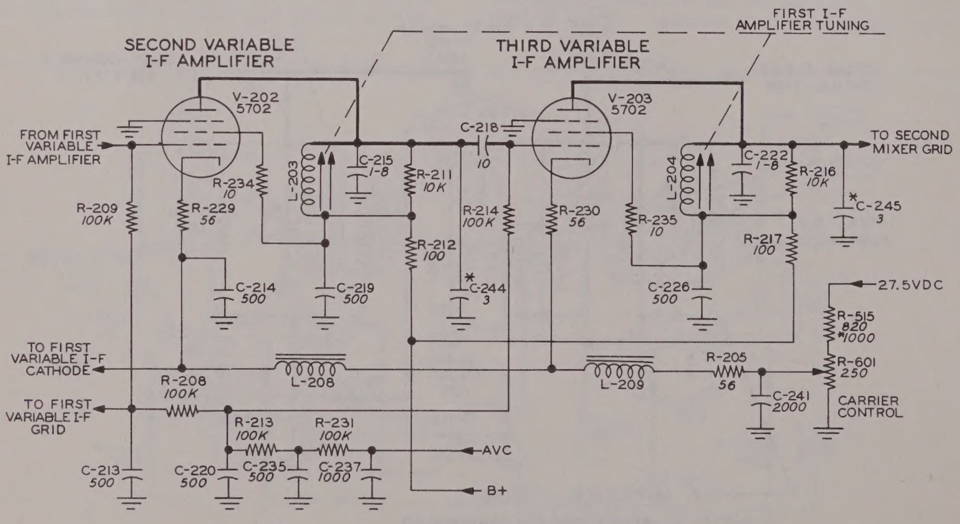

FIRST I-F AMPLIFIER TUNING
FIRST VARIABLE I-F AMPLIFIER
V-201
5702
C-211
10
TO SECOND VARIABLE I-F AMPLIFIER
FROM FIRST MIXER
7
5
2
6
L-202
C-208
1-8
R-206
10K
*
C247
3
R-233
10
R-228
56
R-204
100K
C-212
500
R-207
100
C-207
500
B+
TO SECOND VARIABLE I-F CATHODE
TO SECOND VARIABLE I-F GRID

NOTE:
* SERIAL 200 AND ABOVE (INCLUDING ALL R-425A/ARW-59 MODELS)

Figure 4-9. First Variable I-F Amplifier, Simplified Schematic Diagram

to the first variable i-f amplifier stage. V-201, V-202, and V-203 grids are connected to the avc line through grid resistors R-204, R-209, and R-214, respectively. Avc voltage is obtained from the grid of the first limiter stage, V-305. Sufficient filtering of the avc voltage is accomplished by the use of several low-pass filters located at every i-f stage along the avc line. The cathodes of the three stages are connected through a series of inductances (see figure 4-10) to the CARRIER CONTROL, R-601. These inductances act in conjunction with bypass capacitors C-207, C-214, and C-241 to isolate intermediate frequencies from the cathode line. Note that the cathodes are bypassed below cathode resistors R-228, R-229, and R-230, resulting in some degeneration in these three stages. This degeneration results in less grid-to-cathode capacitance variation, and thereby less plate tank detuning with a change in frequency. The CARRIER CONTROL adjusts the magnitude of the bias voltage obtained from the 27.5-volt dc line. This bias voltage is applied to the cathodes of V-201, V-202, and V-203, and consequently controls the gain of the receiver. The output of the third variable i-f amplifier is coupled by C-225 to the grid of the second mixer, V-204.

4-22. SECOND OSCILLATOR. The second oscillator is a Butler type circuit similar to the first oscillator. Refer to figure 4-11. The grounded grid amplifier, V-205, amplifies noise voltages and applies them to the plate tank consisting of C-229 and L-205. The plate tank attenuates all signals other than the one corresponding to its resonant frequency. Capacitor C-232 couples the signal at the plate of V-205 to the grid of V-206, which acts as a cathode follower and an amplifier. The signal is amplified by V-206 and appears across R-224. The crystal being used couples the signal appearing across R-224 to the cathode of V-205, providing voltage of the proper phase and frequency to sustain oscillation. The position of the slug in L-205 is adjusted by means of the first i-f amplifier


FIRST I-F AMPLIFIER TUNING
SECOND VARIABLE I-F AMPLIFIER
THIRD VARIABLE I-F AMPLIFIER
V-202
5702
V-203
5702
FROM FIRST VARIABLE I-F AMPLIFIER
C-218
10
TO SECOND MIXER GRID
L-203
C-215
1-8
R-211
10K
L-204
C-222
1-8
R-216
10K
*
C-245
3
R-234
10
R-209
100K
R-229
56
R-214
100K
R-230
56
R-235
10
R-212
100
R-217
100
*
C-244
3
C-214
500
C-219
500
C-226
500
27.5VDC
R-515
820
*1000
TO FIRST VARIABLE I-F CATHODE
L-208
L-209
R-205
56
R-601
250
R-208
100K
C-241
2000
CARRIER CONTROL
TO FIRST VARIABLE I-F GRID
R-213
100K
R-231
100K
AVC
C-213
500
C-220
500
C-235
500
C-237
1000
B+

NOTE:
1. * SERIAL 200 AND ABOVE (INCLUDING ALL R-425A/ARW-59 MODELS).

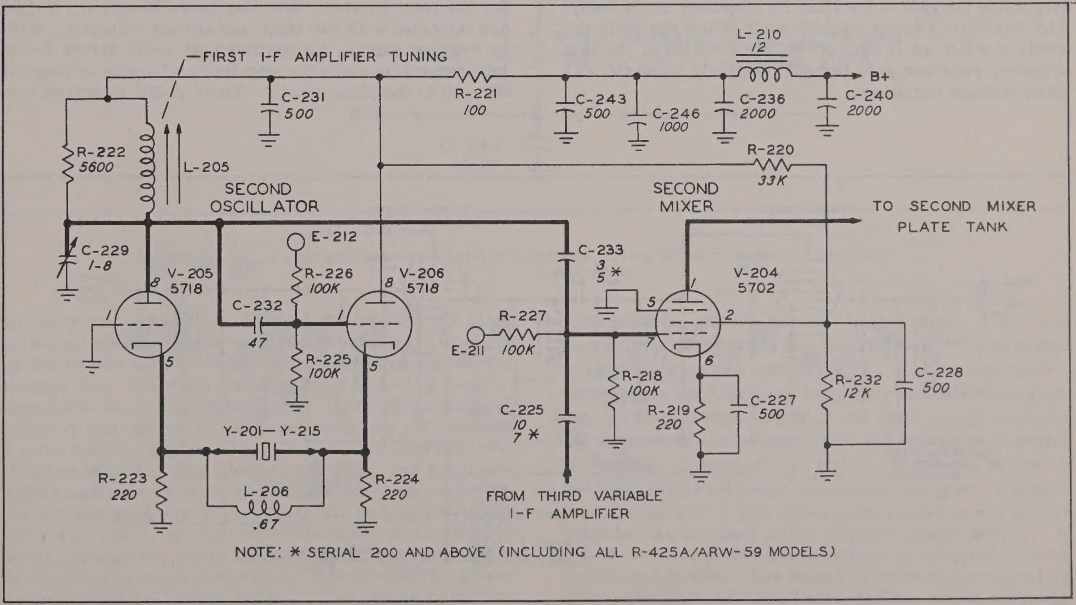
Figure 4-10. Second and Third Variable I-F Amplifier, Simplified Schematic Diagram

tuning control. A crystal is selected from the group Y-201 through Y-215 to tune the oscillator in one-megacycle increments through the frequency range of 58.6 to 72.6 megacycles. C-233 couples the second oscillator output to the grid of the second mixer, V-204.

4-23. SECOND MIXER. Refer to figure 4-11. C-225 couples the third variable i-f amplifier signal to the grid of the second mixer. Here it is heterodyned with the output of the second oscillator to produce the fixed intermediate frequency. The second oscillator frequency is so chosen that it always differs from the variable i-f amplifier frequency by 24.9 megacycles. Thus, the second mixer output will contain, in addition to the two input frequencies, a fixed 24.9-megacycle i-f signal. These signals are coupled to the second mixer plate tank which is located in the second i-f amplifier assembly. Refer to figure 4-12. This tank is half of a capacity-coupled double-tuned circuit consisting of L-301, C-302, C-303, C-304, and L-302. Capacitors C-302 and C-304 provide temperature compensation for amplifier V-301. C-303 provides the capacity coupling. The tank circuit is tuned to the intermediate frequency of 24.9 megacycles and provides a high degree of suppression for the 83.5- to 97.5-megacycle first i-f, and the 58.6- to 72.6-megacycle second oscillator frequencies.

4-24. FIRST AND SECOND FIXED I-F AMPLIFIER. Refer to figure 4-12. The capacity-coupled double-tuned circuit discussed in the preceding paragraph supplies the grid of the first fixed i-f amplifier, V-301, with a substantially pure 24.9-megacycle i-f signal. The signal is amplified by V-301 and applied to a tuned circuit identical to the one in the second mixer plate circuit. This resonant circuit further attenuates all undesired frequencies and passes the i-f signal to the second fixed i-f amplifier. The tuned circuits in the grid and plate of the second fixed i-f amplifier are identical to those of the first fixed i-f amplifier. Resistor R-303 and capacitor C-306 are screen grid decoupling components as are R-306 and C-313. C-308 and C-315 are plate decoupling capacitors for V-301 and V-302, respectively. R-301, R-302, and additional like resistors, are placed across each tank circuit to widen the band pass of the fixed i-f amplifier, thereby enabling the frequency modulated 24.9-megacycle signal to pass. E-333 is incorporated in the cathode circuit for parasitic suppression. The signal is capacitively coupled from the plate of V-302 to the grid of the third fixed i-f amplifier.

4-25. THIRD AND FOURTH FIXED I-F AMPLIFIERS. Refer to figure 4-13. V-303 and V-304 are identical in operation to V-301 and V-302. Figure 4-13, however, illustrates the B-plus supply and the cathode circuits. B-plus is supplied to all plates and screens through P-301-6. Filtering is furnished by L-319 and C-353. Variations in the 27.5-volt dc input voltage which would cause a change in B-plus, and a consequent change in receiver gain, are equalized by varying the bias in the cathode circuits. The cathodes of the four fixed i-f amplifiers are supplied with bias (from the 27.5-volt dc input) through a temperature and voltage compensated network consisting of R-324 through R-327, R-602, and a group of chokes which prevent feedback through the bias line. Temperature compensation is provided by thermistor R-327. Voltage


FIRST I-F AMPLIFIER TUNING
L-210
12
B+
C-231
500
R-221
100
C-243
500
C-246
1000
C-236
2000
C-240
2000
R-222
5600
L-205
SECOND OSCILLATOR
R-220
33K
SECOND MIXER
TO SECOND MIXER PLATE TANK
C-229
1-8
V-205
5718
8
1
5
E-212
R-226
100K
C-232
47
R-225
100K
V-206
5718
8
1
5
C-233
3
5 *
R-227
100K
E-211
V-204
5702
1
5
2
7
6
R-218
100K
R-219
220
C-227
500
R-232
12 K
C-228
500
C-225
10
7 *
Y-201— Y-215
R-223
220
L-206
.67
R-224
220
FROM THIRD VARIABLE I-F AMPLIFIER

NOTE: * SERIAL 200 AND ABOVE (INCLUDING ALL R-425A/ARW-59 MODELS)

Figure 4-11. Second Oscillator and Mixer Circuits, Simplified Schematic Diagram

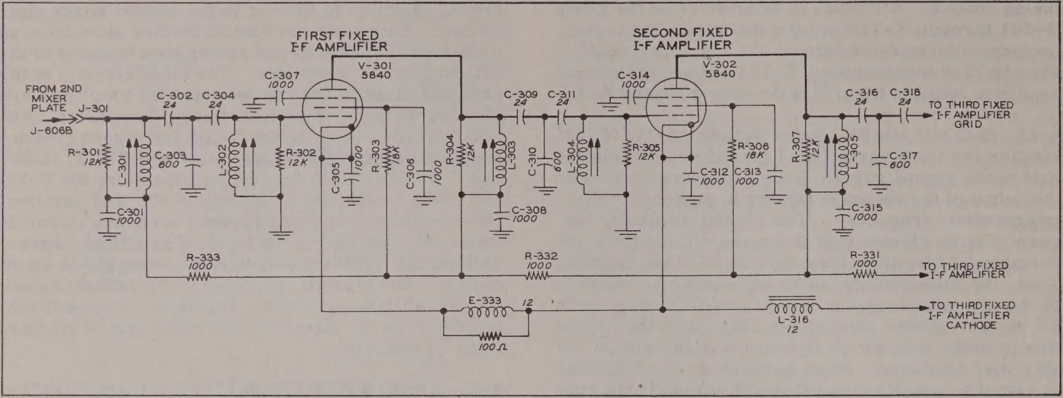

FIRST FIXED
I-F AMPLIFIER
SECOND FIXED
I-F AMPLIFIER
FROM 2ND MIXER PLATE
J-301
J-606B
V-301
5840
V-302
5840
C-301
1000
C-302
24
C-303
600
C-304
24
C-305
1000
C-306
1000
C-307
1000
C-308
1000
C-309
24
C-310
600
C-311
24
C-312
1000
C-313
1000
C-314
1000
C-315
1000
C-316
24
C-317
600
C-318
24
R-301
12K
R-302
12K
R-303
18K
R-304
12K
R-305
12K
R-306
18K
R-307
12K
R-331
1000
R-332
1000
R-333
1000
L-301
L-302
L-303
L-304
L-305
L-316
12
E-333
12
100Ω
TO THIRD FIXED I-F AMPLIFIER GRID
TO THIRD FIXED I-F AMPLIFIER
TO THIRD FIXED I-F AMPLIFIER CATHODE

Figure 4-12. First and Second Fixed I-F Amplifiers, Simplified Schematic Diagram

compensation can best be explained by discussing the action of varistor R-602 with a voltage change. Assume that the 27.5-volt dc input decreases. The B plus voltage decreases resulting in a reduction of current flow through V-301 to V-304, and R-602. The resistance of R-602 therefore reduces, but not in an amount proportional to the reduction of current flow. The varistor functions in a nonlinear fashion, and the resistance decreases by an amount greater than the change of current flow through it. Due to this abnormal reduction in resistance, the bias voltage decreases, increasing the gain of the fixed i-f amplifier accordingly. The varistor reacts equally well in the opposite direction with an increase in input voltage. In this manner, receiver gain is held relatively constant with input voltage variations.

4-26. The highly amplified signal is coupled from the plate of the fourth fixed i-f amplifier, V-304, to the grid of the first limiter, V-305. Coupling is through a capacity-coupled double-tuned circuit identical to the other fixed i-f amplifier tanks, and an RC network consisting of C-333 and R-314. A portion of the signal is tapped off at this point and fed to the carrier relay control circuit.

4-27. LIMITERS. Refer to figure 4-14. The output of the fourth fixed i-f amplifier develops some bias for the first limiter. Limiter tubes V-305 and V-306 are operated with low plate and screen voltages. With an average signal, the positive half-cycle drives V-305 into saturation while the negative half-cycle is coupled through to the plate circuit. Since V-305 is driven into

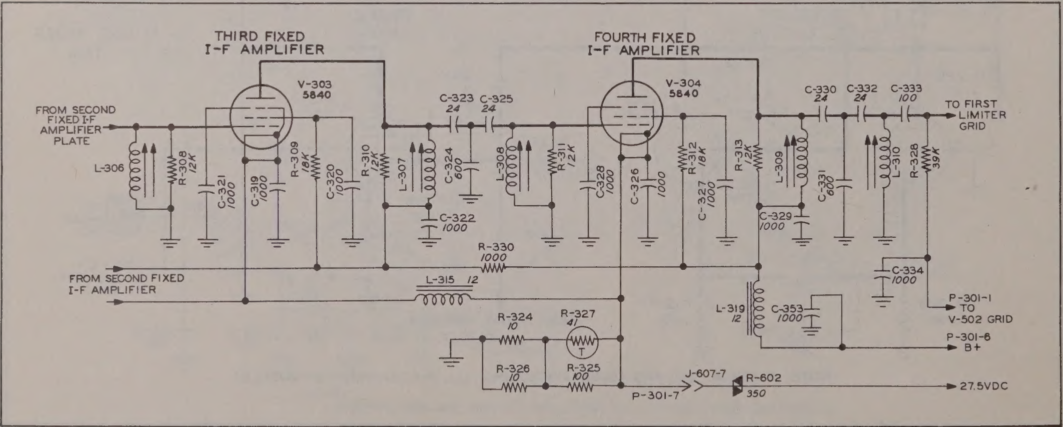

THIRD FIXED
I-F AMPLIFIER
FOURTH FIXED
I-F AMPLIFIER
FROM SECOND FIXED I-F AMPLIFIER PLATE
FROM SECOND FIXED I-F AMPLIFIER
V-303
5840
V-304
5840
L-306
R-308
12K
C-321
1000
C-319
1000
R-309
18K
C-320
1000
R-310
12K
L-307
C-322
1000
C-323
24
C-324
600
C-325
24
L-308
R-311
12K
C-328
1000
C-326
1000
R-312
18K
C-327
1000
R-313
12K
L-309
C-329
1000
C-330
24
C-331
600
C-332
24
L-310
C-333
100
R-328
39K
C-334
1000
R-330
1000
L-315
12
R-324
10
R-327
41
T
R-326
10
R-325
100
L-319
12
C-353
1000
J-607-7
P-301-7
R-602
350
TO FIRST LIMITER GRID
P-301-1
TO
V-502 GRID
P-301-6
B+
27.5VDC

Figure 4-13. Third and Fourth Fixed I-F Amplifiers, Simplified Schematic Diagram

saturation on the positive half-cycle, a portion of the positive pulse is cut off. The signal appears inverted in the plate circuit due to action of V-305. This signal is resistance-capacitance coupled to the second limiter grid. The second limiter is similar in operation to the first limiter. Since the signal at the grid of V-306 is inverted, the remaining half-cycle of the signal is cut off by action of the second limiter. The resulting signal output has a nearly constant amplitude. If the signal input to V-305 is great enough, both V-305 and V-306 will be driven to cutoff on the negative half-cycle also. The resultant output, however, remains the same. Grid current through R-314, caused by the positive half of the signal, develops avc voltage at the grid of V-305. Avc voltage is discussed in detail in paragraph 4-30. The output of V-306 is applied to the resonant primary of the discriminator transformer.

4-28. DISCRIMINATOR. Refer to figure 4-15. The tuned primary of the discriminator transformer, consisting of L-313 and C-342, couples two voltages (E_1 and E_2) to the discriminator secondary circuit. The discriminator secondary circuit is comprised of L-313, C-345, and R-320. C-344 capacitively couples one voltage (E_1) to the center tap of L-314. The other voltage (E_2) is inductively coupled to L-314 through the mutual inductance of the discriminator transformer primary and secondary. The voltage between the plate of either discriminator tube and ground (E_{D1} or E_{D2}) is the vector sum of the voltage E_1 and one-half of the voltage E_2. When the signal applied to L-313 corresponds to the resonant frequency of the discriminator primary and secondary, a 90-degree phase relationship exists between E_1 and E_2. The voltages between the discriminator plates and ground (E_{D1} and E_{D2}) are equal, as indicated by the vector addition shown by solid lines in figure 4-15. Since the voltages E_{D1} and E_{D2} are equal, the net discriminator d-c output is zero. However, when the applied frequency differs from the resonant frequency, the 90-degree phase relationship no longer exists. The phase relations may assume the positions indicated in the vector diagram by the two types of dashed lines. The resultant voltages E_{D1} and E_{D2} are no longer equal, and a d-c output is obtained from the discriminator. The output is negative when the input frequency is above resonance, and positive when the input frequency is below resonance. The frequency modulation on the input signal consists of components which vary above and below the resonant frequency. Consequently, the discriminator converts the frequency modulation into audio voltages. Capacitors C-346 and C-338 bypass the rectified r-f signal frequencies present in the discriminator output. A small portion of the audio output is dropped across R-323 and R-604. The major portion of the signal is present across AF CONTROL R-603, which provides adjustment of the amplitude of audio signal applied to the audio output stage.

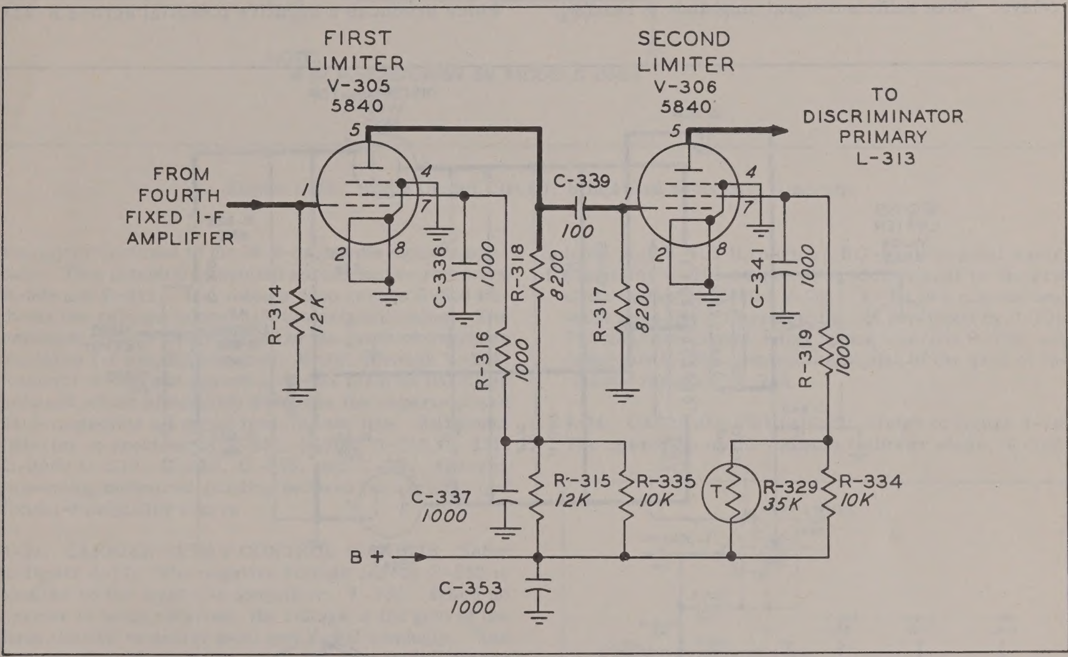
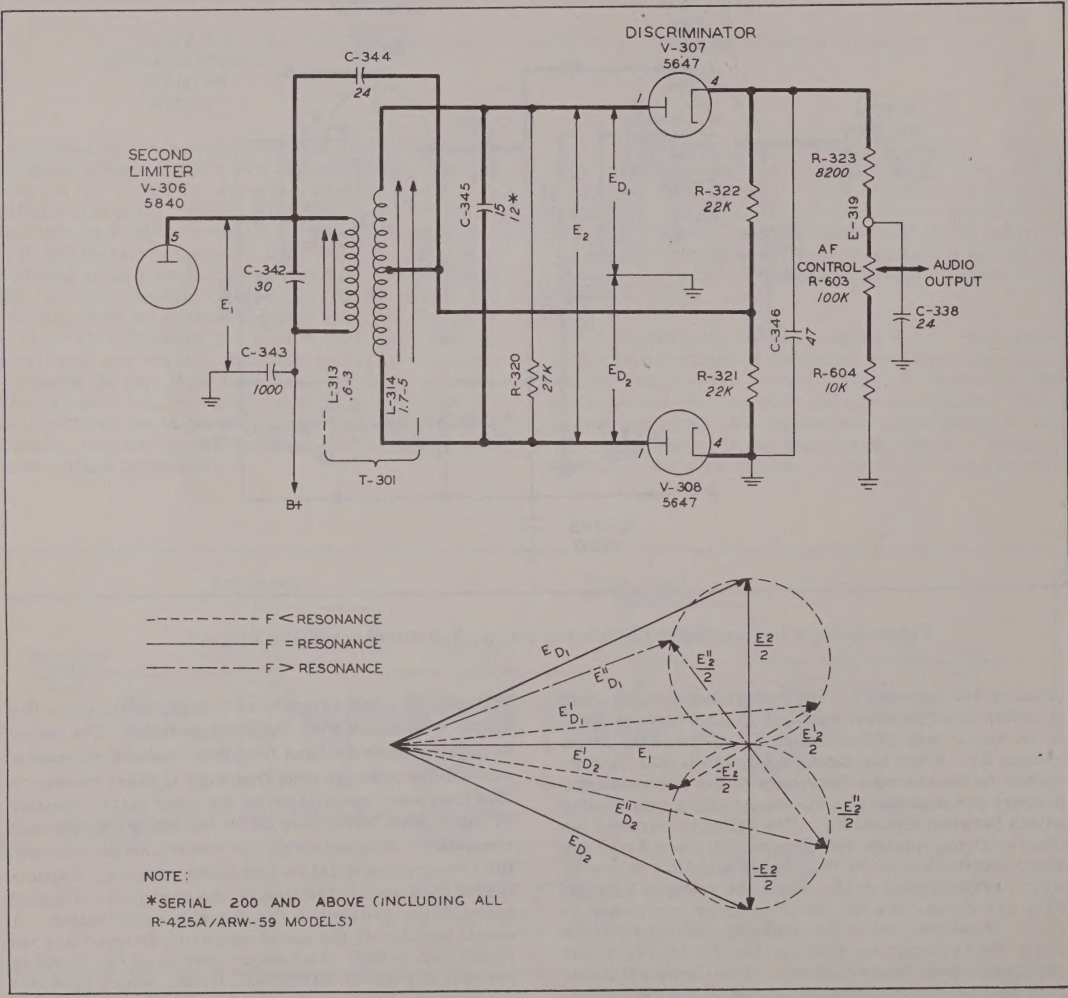


Figure 4-14. First and Second Limiter Circuits, Simplified Schematic Diagram

4-29. AUDIO OUTPUT. Refer to figure 4-16. Capacitor C-501 couples the output of the discriminator stage to the grid of the audio output amplifier, V-501. This stage operates as a cathode follower and develops a signal voltage across R-502 and R-503. Resistor R-501 is connected to the junction of R-502 and R-503 to provide the proper operating bias. Capacitor C-614B provides additional B-plus filtering. The output signal is applied to contact 8 on the carrier relay K-601. With no signal input to the receiver, the carrier relay remains open. Noise voltages emanating from the audio output stage are dissipated in R-605. Highly amplified noise voltages are therefore not fed to Audio Decoder KY-55/ARW during periods of no or low signal level, which prevents the spurious operation of the decoder relays. When sufficient signal amplitude is reached, the carrier relay closes, coupling the audio output signal to the audio output connector J-602. This audio signal is coupled to Audio Decoder KY-55/ARW through a length of RG-58/U cable. The cathode follower (audio output) stage produces a low impedance output which may be transmitted through relatively long lengths of cable.

4-30. AVC CIRCUITS. Refer to figure 4-17. Avc voltage is obtained from the grid of the first limiter stage V-305. As the amplitude of the fixed 24.9-megacycle i-f signal increases, the grid of V-305 will be driven further and further into the positive grid region on the positive half-cycles. This results in grid current flow which produces a negative potential across R-314,


DISCRIMINATOR
V-307
5647
C-344
24
SECOND
LIMITER
V-306
5840
5
1
4
C-342
30
E_1
C-343
1000
L-313
.6-3
L-314
1.7-5
T-301
B+
C-345
15
12*
R-320
27K
E_{D_1}
E_2
E_{D_2}
R-322
22K
R-321
22K
C-346
47
R-323
8200
E-319
AF
CONTROL
R-603
100K
AUDIO
OUTPUT
C-338
24
R-604
10K
V-308
5647
F < RESONANCE
F = RESONANCE
F > RESONANCE
E_{D_1}
E''_{D_1}
E'_{D_1}
E'_{D_2}
E_1
E''_{D_2}
E_{D_2}
$\frac{E_2}{2}$
$\frac{E''_2}{2}$
$\frac{E'_2}{2}$
$\frac{-E'_2}{2}$
$\frac{-E''_2}{2}$
$\frac{-E_2}{2}$

NOTE:
*SERIAL 200 AND ABOVE (INCLUDING ALL R-425A/ARW-59 MODELS)

Figure 4-15. Discriminator Circuit, Simplified Schematic Diagram

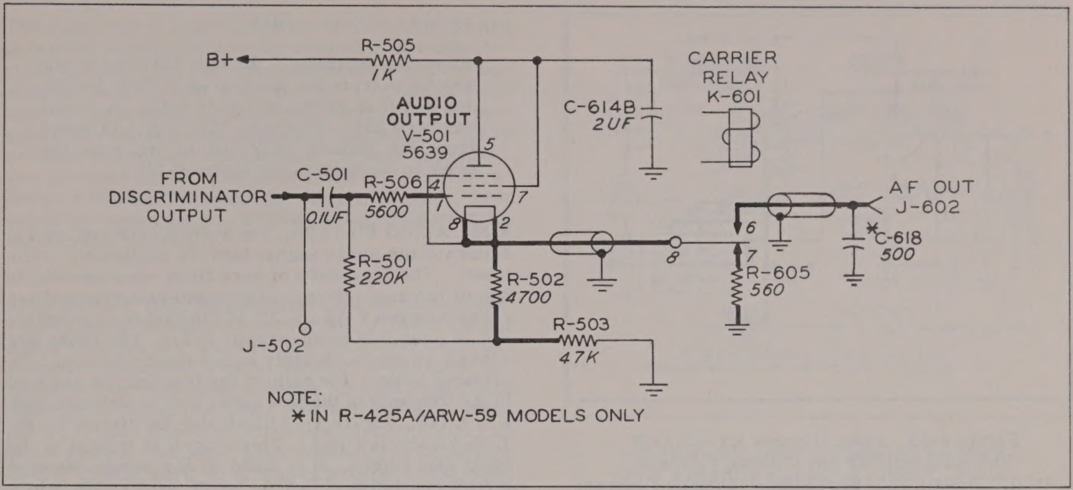

B+
R-505
1K
AUDIO
OUTPUT
V-501
5639
C-614B
2UF
CARRIER
RELAY
K-601
FROM
DISCRIMINATOR
OUTPUT
C-501
0.1UF
R-506
5600
R-501
220K
R-502
4700
R-503
47K
J-502
AF OUT
J-602
C-618
500
R-605
560
NOTE:
* IN R-425A/ARW-59 MODELS ONLY

Figure 4-16. Audio Output Circuit, Simplified Schematic Diagram

roughly proportional to the 24.9-megacycle signal amplitude. This potential is applied across series resistors R-509 and R-512. The voltage drop across R-509 reduces the voltage to one-half the original value. The resultant voltage is connected to the grids of the three variable i-f amplifier tubes, V-201 through V-203. Resistor R-328 and capacitor C-334 form an RC filter network which effectively removes the superimposed 24.9-megacycle i-f signal from the avc line. Additional filtering is provided by R-203, R-208, R-213, R-231, C-206, C-213, C-220, C-235, and C-237, thereby preventing undesired coupling between the variable and fixed i-f amplifier stages.

4-31. CARRIER RELAY CONTROL CIRCUITS. Refer to figure 4-17. The negative voltage across R-512 is applied to the first d-c amplifier, V-502. When no carrier is being received, the voltage at the grid of the first limiter is nearly zero and V-502 conducts. The current flow through the plate resistor R-507 biases the second d-c amplifier grid strongly negative with respect to its cathode. V-503 is biased to cutoff and relay K-601 is de-energized. When a carrier is received, the first limiter grid goes negative, causing V-502 to cut off. With no current flow through R-507, and therefore no voltage drop across it, the voltage at the grid of V-503 tends to approach the B-plus supply voltage. This biases the grid of V-503 strongly positive with respect to its cathode. The grid of V-503 draws current through R-507 producing a voltage drop across it which subtracts from the input voltage. The grid is therefore maintained slightly above the cathode potential. V-503 conducts and closes relay K-601. Audio output is fed through the contacts of this relay to Audio Decoder KY-55/ARW.

4-32. AUDIO DECODER KY-55/ARW.

4-33. VOLTAGE AMPLIFIER. Refer to figure 4-18. The audio output signal of the receiver is applied to input jack J-701 through an RG-58/U coaxial cable. Capacitor C-701 couples the audio signal to the grid of the voltage amplifier V-701. V-701 is a conventional audio amplifier. Operating bias is developed by R-704. The amplified signal output appears across R-703, and capacitor C-702 couples the signal to the grid of the cathode follower, V-702.

4-34. CATHODE FOLLOWER. Refer to figure 4-18. The operation of the cathode follower stage, V-702,

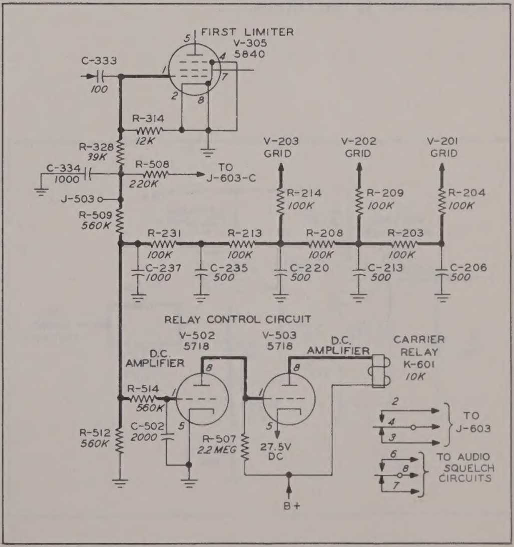

FIRST LIMITER
V-305
5840
C-333
100
R-314
12K
R-328
39K
C-334
1000
R-508
220K
TO
J-603-C
J-503
R-509
560K
V-203
GRID
V-202
GRID
V-201
GRID
R-214
100K
R-209
100K
R-204
100K
R-231
100K
R-213
100K
R-208
100K
R-203
100K
C-237
1000
C-235
500
C-220
500
C-213
500
C-206
500
RELAY CONTROL CIRCUIT
V-502
5718
D.C.
AMPLIFIER
V-503
5718
D.C.
AMPLIFIER
CARRIER
RELAY
K-601
10K
R-514
560K
C-502
2000
R-512
560K
R-507
2.2 MEG
27.5V
DC
TO
J-603
TO AUDIO
SQUELCH
CIRCUITS
B+

Figure 4-17. Avc and Relay Control Circuits, Simplified Schematic Diagram

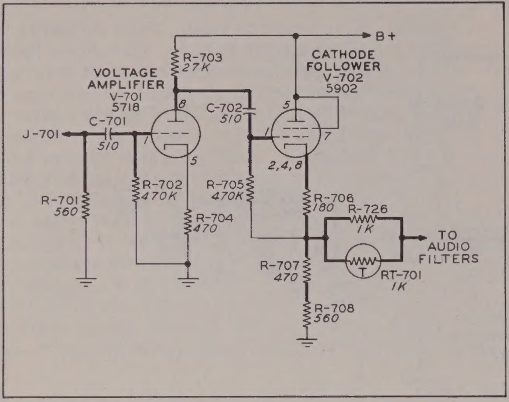


Figure 4-18. Audio Decoder KY-55/ARW, Voltage Amplifier and Cathode Follower, Serial 1 through 233, Simplified Schematic Diagram

is also conventional. The amplified output signal appears across R-706, R-707, and R-708 in the cathode circuit. Resistor R-705 is connected to the junction point of R-706 and R-707 to establish the correct operating bias for V-702. The two resistors, R-707 and R-708, are used in place of a single resistor to supply adequate power dissipation. The audio output is connected to the inputs of ten parallel-connected audio filters through a temperature compensating network consisting of R-726 and varistor RT-701. The cathode follower has a low impedance output which presents a minimum load to the filters.

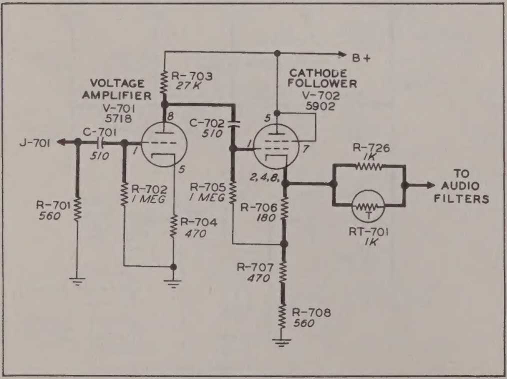


Figure 4-19. Audio Decoder KY-55/ARW, Voltage Amplifier and Cathode Follower, Serial 234 and Above, Simplified Schematic Diagram

NOTE

> In serial numbers 1 through 233, the output was taken from the junction of R-705, R-706, and R-707 as shown in figure 4-18. In serial numbers 234 and above, the output is taken from the cathode of V-702 to increase the drive to the filters (see figure 4-19).

4-35. AUDIO FILTERS. Ten audio filters are used to separate the audio signal into its component audio tones. The frequency of each filter corresponds to one of the audio tones. The audio tone frequencies range between 7.50 and 22.17 kilocycles; a complete list is provided in paragraph 1-21. The tones are spaced at approximately equal intervals on a logarithmic scale. The ratio of the frequency of any tone to the frequency of the next higher tone is approximately 1 to 1.128. Figure 4-20 illustrates the circuit for the 7.50-kilocycle filter. This circuit is typical of the other nine filters. It is made up of a series resonant circuit consisting of C-703, L-701 and L-702B, which is inductively coupled by L-702B to a parallel resonant circuit comprised of C-704 and L-702A. Capacitors C-703 and C-704 consist of from one to three fixed mica capacitors in parallel, as required. Trimmer capacitors C-738 and C-739 aid in properly tuning the filters. Inductor L-701 is a toroidal coil. Inductor L-702 is similar to L-701 except that it has a coupling link, L-702B, wound with its main winding, L-702A. Toroidal coils are used due to their high Q and small space requirement. Also, all flux is confined to the core which reduces spurious distribution throughout the chassis. The resonant circuits are tuned to within 0.3 percent of the selected audio tone frequencies.

4-36. RELAY AMPLIFIER OPERATION. Refer to figure 4-20. A signal containing a 7.50-kilocycle tone is applied to C-738, C-703, and L-701. These components provide the 7.50-kilocycle tone with a low reactance path to ground. The current flowing through C-738, C-703, and L-701 also flows through L-702B, transferring energy to the parallel resonant filter comprised of L-702A, C-739, and C-704. A comparatively high a-c voltage is developed across this resonant circuit. This a-c voltage is applied through resistor R-709 to the grid of the relay amplifier V-703. On the positive half cycles, current flows through V-703 and the coil of relay K-701. The relay, however, will not operate on pulsating d-c current. Filter capacitor C-705 is added to convert these pulses into a relatively steady d-c current, which operates relay K-701. Contacts on the relay are normally connected to operate an associated external flight control circuit. Bias for the stages is provided by tying the cathodes to a voltage divider consisting of R-727, R-728, and R-729. Approximately 9 volts is developed across R-729 placing the grids negative with respect to the cathodes. The ten filters, relay amplifiers, and relays differ only in their frequency of operation.

4-37. POWER GENERATION AND DISTRIBUTION.

4-38. FILAMENT CIRCUITS. The complete filament circuits of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW are illustrated in figure 7-6.

The filaments of Radio Receiver R-425/ARW-59 are connected in parallel with the filaments of Audio Decoder KY-55/ARW, and both components are connected across the 27.5-volt d-c source. The filaments in each of the parallel circuits are connected in series-parallel with current balancing resistors used to equalize the voltage distribution. Bypass capacitors are provided on all r-f and i-f stages to prevent undesired feedback through the filament leads. Test points are keyed out at convenient locations throughout the filament circuit.

4-39. **PLATE VOLTAGE SUPPLY.** All the plate supply requirements of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW are generated by Dynamotor D-601 located in Radio Receiver R-425/ARW-59. An input filter consisting of L-606, C-614A, and C-616 operates in conjunction with C-608 to prevent the dynamotor from reflecting noise back into the aircraft power system. An output filter consisting of capacitors C-613, C-612, and C-614C serves to bypass dynamotor interference noise from the plate supply circuits of Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW.

NOTE

Capacitors C-616 and C-618 were added in Radio Receiver R-425A/ARW-59 to reduce conducted noise and radiated interference.

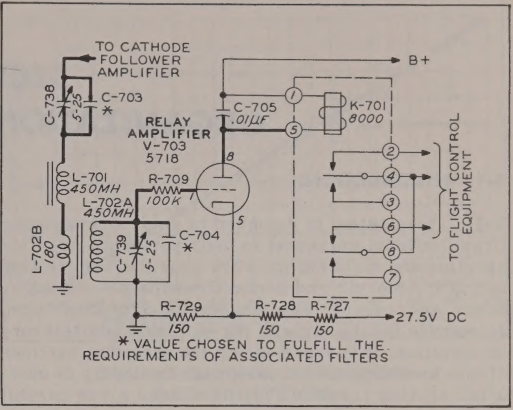

TO CATHODE FOLLOWER AMPLIFIER
B+
C-738
5-25
C-703
*
C-705
.01μF
K-701
8000
RELAY AMPLIFIER
V-703
5718
L-701
450MH
R-709
100K
L-702A
450MH
L-702B
180
C-739
5-25
C-704
*
1
5
2
4
3
6
8
7
TO FLIGHT CONTROL EQUIPMENT
R-729
150
R-728
150
R-727
150
27.5V DC
* VALUE CHOSEN TO FULFILL THE REQUIREMENTS OF ASSOCIATED FILTERS

Figure 4-20. Audio Decoder KY-55/ARW, Relay Amplifier and Audio Filter Circuits, Simplified Schematic Diagram

NOTE

Capacitor C-617 was changed from .002 microfarad to .01 microfarad and L-607 and C-615 were added in Radio Receiver R-425A/ARW-59. These component changes were made to reduce noise emanating from blower motor B-601.

SECTION V
ORGANIZATIONAL MAINTENANCE

5-1. INTRODUCTION.

5-2. This section is designed to guide Operational-Organizational personnel in their performance of inspection and maintenance work upon Radio Receiving Set AN/ARW-59 and Audio Decoder KY-55/ARW. Since successful maintenance is dependent upon reasonable familiarity with the equipment and its theory of operation, it is assumed that the preceding sections of this handbook, and in particular the theory of operation section (section IV), have been given careful study.

5-3. Maintenance of this equipment is based upon a series of inspections designed to detect and correct conditions that might lead to malfunctioning of the equipment. Four inspections are given: preflight, postflight, daily and major. The preflight, postflight and daily inspections are rapidly performed without removing the equipment from the aircraft. However, the importance of these three inspections cannot be overemphasized. Since equipment failure during flight will probably result in the destruction of the aircraft and its radio equipment, the equipment must be carefully inspected before and after every flight to detect defects before failure occurs. The major inspection requires that the equipment be removed to a test bench and carefully tested. This inspection, in conjunction with the preflight, postflight, and daily inspections, assures that the equipment is free from progressive defects which might eventually cause failure.

5-4. Difficulties encountered in any of the three inspections must, of course, be corrected. Information is given in section VI to aid in tracing the fault to the defective component and for correcting the fault by replacement of the defective part.

5-5. PREFLIGHT INSPECTION.

5-6. GENERAL. The following preflight inspection should be performed prior to every flight. Any defects disclosed by this check that cannot be readily remedied will necessitate replacement of the equipment with properly functioning units or grounding of the aircraft until such time that the equipment may be repaired. The following test equipment must be available to perform a preflight inspection:

NOTE

> The following procedures and tests apply equally to Radio Receiver R-425/ARW-59 and R-425A/ARW-59, unless otherwise specified.

a. Schrader #3715 Pressure Indicator Gauge or equivalent.

b. Electronic Multimeter ME-6A/U.

5-7. PROCEDURE. Conduct the following inspection to ascertain that the equipment is operating satisfactorily.

a. Check all mountings to see that they are rigidly affixed to the aircraft.

b. Determine whether the equipment is securely clamped to the mountings. The clamps should be hand tightened. The mount clamping nuts should be properly safety wired.

c. Examine the cables to ascertain that they are properly placed and that they do not restrict the movement of the equipment upon the mountings. Look for evidence of chafing between the cables and the aircraft structure.

d. Hand tighten the locking rings on all connectors.

e. Using a Schrader #3715 Pressure Indicator Gauge or equivalent, check the air pressure inside of Radio Receiver R-425/ARW-59, and Audio Decoder KY-55/ARW. Proper air pressure is 5 psi. If the pressure is not approximately 5 psi, check the screws holding the front casting to the cabinet for tightness. Inflate to the proper pressure.

f. Check the audio output level of Radio Receiver R-425/ARW-59 by means of the following procedure:

1. Remove cabinet from Radio Receiver R-425/ARW-59.

2. Energize Radio Receiving Set AN/ARW-59.

3. Allow approximately fifteen minutes for the equipment to reach operating temperature.

4. Disconnect P-602 from the AUDIO OUTPUT connector (test point ☆2, J-602) on Radio Receiver R-425/ARW-59.

5. Connect Electronic Multimeter ME-6A/U, shunted with 560-ohm, 2-watt resistor, between the center conductor of J-602 (test point ☆2, AUDIO OUTPUT) and ground. If a "Tee" cable assembly such as the Audio Test Cable Assembly can be obtained, connect one end to J-602, one end to Electronic Multimeter ME-6A/U and the other end to a suitable load (a 560-ohm resistor or the Dummy AF Load).

6. Connect Multimeter TS-352/U between test point ☆7 (E-605) and ground. Note input voltage value.

7. Operate the transmitting equipment to transmit a 7.50-kilocycle control tone and note the indication on Electronic Multimeter ME-6A/U. The proper output value is shown in figure 5-1. If the indication is not as indicated in figure 5-1, adjust AF CONTROL (R-603) to secure desired indication.

CAUTION

If the AF CONTROL is not properly adjusted, within reasonable limits, the equipment may fail when airborne despite proper operation at ground level.

8. Disconnect the voltmeter and reconnect P-602. Replace cabinet.

g. With the receiving equipment energized, operate the controls at the transmitter and note the response of each control function.

5-8. POSTFLIGHT INSPECTION.

5-9. It is recommended that the preflight inspection given above be performed after every flight. This will uncover troubles that develop during flight and insure proper equipment operation.

5-10. DAILY INSPECTION.

5-11. TEST EQUIPMENT. The following test equipment is required to perform the daily inspection.

a. Schrader #3715 Pressure Indicator Gauge or equivalent.

b. Electronic Multimeter ME-6A/U.

c. Signal Generator SG-50/ARW.

d. Ohmmeter or other continuity checking device.

5-12. PROCEDURE. Conduct the following inspection:

a. Perform the preflight inspection given in paragraphs 5-5, 5-6 and 5-7.

b. Disconnect P-601 from the ANT connector (test point ☆1, J-601) on Radio Receiver R-425/ARW-59 and connect the output of Signal Generator SG-50/ARW in its place. Use a length of RG-58/U cable terminated at each end by UG-88/U connectors to make the connection.

c. Remove P-602 from J-602 (test point ☆2, AUDIO OUTPUT) on Radio Receiver R-425/ARW-59. Connect Electronic Multimeter ME-6A/U, shunted with a 560-ohm, 2-watt resistor, between the center conductor and ground. If a "Tee" cable such as the Audio Test Cable Assembly can be obtained, connect one end to J-602, one end to Electronic Multimeter ME-6A/U and the other end to a suitable load (a 560-ohm resistor or the Dummy AF Load).

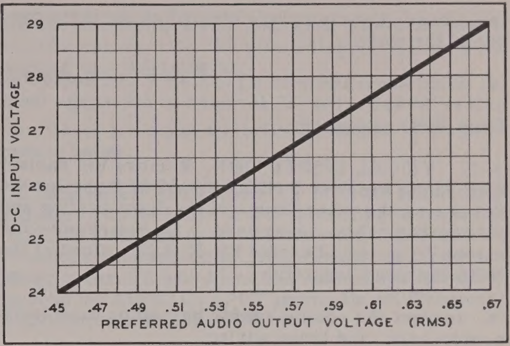


Figure 5-1. Preferred Values of Audio Output Voltage

d. Slowly increase the output of Signal Generator SG-50/ARW and watch for a sudden change on Electronic Multimeter ME-6A/U. This indicates carrier relay (K-601) closure. The carrier relay should close at the signal level for which it was set when the receiver was installed. If carrier relay does not close at desired level, remove cabinet from receiver. Set Signal Generator SG-50/ARW to desired level and adjust CARRIER CONTROL (R-601) to secure relay closure. Replace cabinet.

5-13. MAJOR INSPECTION.

5-14. GENERAL. The major inspection procedure is designed to detect equipment trouble before actual operational failure results. Inspections should be made at regular intervals of not more than 100 hours. Procedures for further isolation of trouble are given in paragraph 5-20.

5-15. TEST EQUIPMENT. The following test equipment must be available to provide a complete test set-up for this inspection.

a. Signal Generator SG-50/ARW.

b. Audio Coder KY-51/ARW.

c. Electronic Multimeter ME-6A/U.

d. Vacuum Tube Voltmeter TS-375/U.

e. Test Bench Cable Set AN/ARM-15.

f. Signal Generator TS-382A/U.

g. Meter R16AN-USM26HWP.

5-16. PRELIMINARY PROCEDURE. Radio Receiver R-425/ARW-59 and Audio Decoder KY-55/ARW should be removed from the aircraft by use of the following procedure:

a. Disconnect all cables.

b. Remove safety wire from the clamping nuts on both mountings (Mounting MT-950/ARW).

c. Loosen the clamping nuts and swing them down out of the way.

d. Slide Audio Decoder KY-55/ARW and Radio Receiver R-425/ARW-59 forward to disengage them from their mountings.

5-17. VISUAL INSPECTION. Remove the cabinet from Radio Receiver R-425/ARW-59 by loosening the screws on the outer flange of the front casting and sliding the cabinet rearward. Do not remove the cabinet from Audio Decoder KY-55/ARW. Conduct the following visual inspection:

a. Inspect the equipment for burned or discolored components, and loose wiring.

b. Check the plugs for corrosion, bent pins and cracked insulation.

c. Inspect the receiver for loose subassemblies and missing or loose mounting hardware.

d. Inspect the commutator of the dynamotor for pitting. If the commutator is badly pitted, the dynamotor should be removed and returned to the overhaul station. Slight pitting may be removed by the use of No. 000 sandpaper and canvas cloth.

CAUTION

Do not use emery cloth in place of sandpaper. Emery is conductive and may cause short circuits in the armature by becoming imbedded in the slots between the bars.

e. Remove the brushes from the dynamotor and replace with new ones. The brushes must be seated by the use of a strip of No. 000 sandpaper placed between the commutator and the brushes. Apply only normal brush pressure. Draw the sandpaper up tightly to conform to the curvature of the commutator and move the sandpaper in the direction of normal dynamotor rotation.

CAUTION

Do not move strip back and forth.

f. After fitting, a special brush seating stone may be used to smooth out grooves left by the abrasive. After brushes have been replaced, the dynamotor should be run at normal load for 1 hour to assure that the brushes will seat properly.

5-18. BENCH TEST PROCEDURE. Connect Radio Receiver R-425/ARW-59, Audio Decoder KY-55/ARW and test equipment as shown in figure 5-2. Signal Generator SG-50/ARW is connected to J-601 (test point ☆1 ANTENNA INPUT). Electronic Multimeter ME-6A/U is connected across the audio output between J-602 (test point ☆2, AUDIO OUTPUT) and ground. Conduct the following inspection procedure:

a. Remove cabinet from Radio Receiver R-425/ARW-59.

b. Apply 27.5-volt dc power to the equipment by turning the POWER switch on the Test Control Unit to the ON position. Connect Multimeter TS-352/U between either 28 V DECODER TEST POINT and ground. Set input voltage to 27.5 volts. Maintain at this value through subsequent procedures.

c. Allow approximately 5 minutes for the equipment to reach operating temperature.

d. Tune Signal Generator SG-50/ARW to the same frequency channel as Radio Receiver R-425/ARW-59.

e. Check the signal input level required to cause carrier relay (K-601) operation with the CARRIER CONTROL, R-601, set in its extreme clockwise and counterclockwise positions. Follow the procedure below:

1. Set the CARRIER CONTROL, R-601, to its full clockwise position.

2. Increase the input signal level until the CARRIER RELAY OPERATE light on the Test Control Unit glows, indicating that the carrier relay has closed. The carrier relay should close with less than 1-microvolt signal input.

3. Rotate the CARRIER CONTROL, R-601, to its full counterclockwise position.

4. Increase the signal input level to cause carrier relay closure. Greater than 100 microvolts should be required to cause carrier relay closure.

f. Apply 3 microvolts of signal input to Radio Receiver R-425/ARW-59. Adjust the CARRIER CONTROL, R-601, to secure carrier relay closure at this signal input value. To read the first limiter grid voltage, connect Voltmeter TS-375/U between ground and J-503 (test point ☆5) on the audio and carrier relay board. This voltage may also be read at the FIRST LIMITER GRID test point on the Test Control Unit. The 3-microvolt signal should produce approximately -2.0 volts dc at the first limiter grid.

g. Remove the input signal from Radio Receiver R-425/ARW-59. Note the first limiter grid voltage on Voltmeter TS-375/U. Approximately -1.5 volts should be present. This residual voltage is generated by noise voltages in the first few stages of the receiver.

h. Rotate the AF CONTROL, R-603, to the extreme clockwise position.

i. Check the signal-to-noise ratio between unmodulated and modulated signal input in accordance with the following procedure:

1. Apply a 5-microvolt unmodulated signal to Radio Receiver R-425/ARW-59. Connect a Ballantine 300

Voltmeter across the AUDIO OUTPUT jack (test point ☆) and note output voltage. If a Ballantine 300 Voltmeter cannot be obtained, Electronic Multimeter ME-6A/U may be used with somewhat less satisfactory results.

2. Set Signal Generator SG-50/ARW to obtain 1000-cycle modulation at 120-kilocycle deviation. Check the audio output voltage. Compare the audio voltage obtained in step 1 with the voltage obtained in step 2. A voltage ratio of at least 6 db (1 to 2) should be secured using a Ballantine 300 Voltmeter. A voltage ratio of at least 4 db (1 to 1.6) should be obtained with Electronic Multimeter ME-6A/U.

j. Increase the output of Signal Generator SG-50/ARW slowly. The signal must be modulated as stated in step i.2. above. Watch the a-f output indication on Electronic Multimeter ME-6A/U. As the signal input increases, the a-f output should increase to a minimum of 1 volt rms, level off, and then remain relatively constant.

k. Rotate the AF CONTROL, R-603, to the full counterclockwise position. With an input signal modulated as in step i.2. the a-f output indication on Electronic Multimeter ME-6A/U should be 0.35 volts rms or less.

l. Set the AF CONTROL, R-603, to obtain an indication of 0.60 volts rms on Electronic Multimeter ME-6A/U. Apply a 200-microvolt signal modulated at 1000 cycles with 120 kilocycles deviation while making this adjustment.

m. Check for audio distortion by means of the procedure below:

1. Disconnect Audio Coder KY-51/ARW and connect a General Radio 1301A Audio Oscillator to the EXT. MOD. INPUT jack on Signal Generator SG-50/ARW. Connect a General Radio 1932A Noise and Distortion Meter in parallel with Electronic Multimeter ME-6A/U (across the AUDIO OUTPUT jack). Do not disconnect Audio Decoder KY-55/ARW.

2. Rotate EXT. MOD. control on Signal Generator SG-50/ARW to 500 OHMS. Tune General Radio 1301A to 1000 cps. Tune Signal Generator SG-50/ARW to receiver frequency and set DEVIATION to 120 kilocycles. Increase output to 1000 microvolts.

3. Adjust AF CONTROL, R-603, to obtain an indication of 0.60 volts on Electronic Multimeter ME-6A/U.

4. Using General Radio 1932A, check percentage of noise and distortion. The distortion and noise should not exceed 5 percent.

n. Use the following procedure to check the band pass of Radio Receiver R-425/ARW-59.

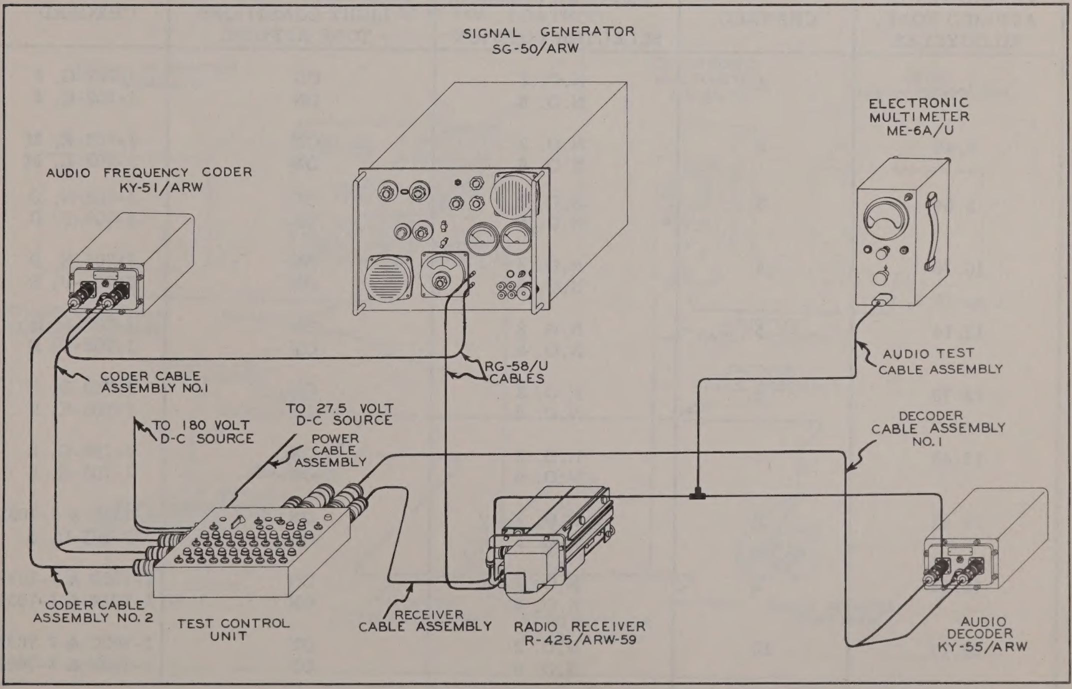

SIGNAL GENERATOR
SG-50/ARW
ELECTRONIC
MULTIMETER
ME-6A/U
AUDIO FREQUENCY CODER
KY-51/ARW
AUDIO TEST
CABLE ASSEMBLY
RG-58/U
CABLES
CODER CABLE
ASSEMBLY NO.1
TO 27.5 VOLT
D-C SOURCE
TO 180 VOLT
D-C SOURCE
POWER
CABLE
ASSEMBLY
DECODER
CABLE ASSEMBLY
NO. 1
CODER CABLE
ASSEMBLY NO. 2
TEST CONTROL
UNIT
RECEIVER
CABLE ASSEMBLY
RADIO RECEIVER
R-425/ARW-59
AUDIO
DECODER
KY-55/ARW

Figure 5-2. Bench Test Setup for Major Inspection

1. Disconnect General Radio 1932A and General Radio 1301A. Reconnect Audio Coder KY-51/ARW as shown in figure 5-2. Turn EXT. MOD. control to OFF. Turn Signal Generator SG-50/ARW to minimum output.

2. With no signal input, the first limiter grid voltage should be approximately -1.5 volts dc as indicated on Voltmeter TS-375/U. Apply an unmodulated signal of sufficient amplitude to cause the first limiter grid voltage to become exactly 0.5 volts more than the no-signal value. This voltage will be used as the reference voltage for determining the band pass for Radio Receiver R-425/ARW-59.

3. Double the signal input amplitude required in the previous step. Tune Signal Generator SG-50/ARW each side of the channel frequency to obtain the reference voltage described in step 2. The total frequency deviation on both sides of center is the bandwidth at 6 db. The bandwidth should be approximately 665 kilocycles. The a-f output, as indicated upon Electronic Multimeter ME-6A/U, should vary uniformly as the r-f input is tuned each side of center. The bandwidth should be approximately centered.

o. Rotate EXT. MOD. control on Signal Generator SG-50/ARW to 500 OHMS. Modulate Signal Generator SG-50/ARW with a 7.50-kilocycle tone obtained from Audio Coder KY-51/ARW. This is accomplished by operating the Test Control Unit CODER switch, channel 1, to the ON position. Adjust Signal Generator SG-50/ARW to 200 microvolts output and 120 kilocycles deviation. Connect to the ANTENNA INPUT connector (test point ☆, J-601) on Radio Receiver R-425/ARW-59.

p. Note audio output voltage indication on Electronic Multimeter ME-6A/U. This voltage should be 0.60 volts rms. If it is not, adjust AF CONTROL, R-603 to obtain the proper voltage.

q. Simultaneously apply any five tones to Audio Decoder KY-55/ARW by operating any 5 switches between CHANNEL 1 and 10 on the Test Control Unit. Operate the DECODER RELAY CONTACT SELECTOR to the N.O. 2 position. Note whether the corresponding indicator lights on the Test Control Unit become energized. Only the indicators corresponding to the tones applied should light. Operate the DECODER RELAY CONTACT SELECTOR to the N.O. 6 position. The same indicator lights should become energized. Refer to table XI.

TABLE XI. AUDIO DECODER KY-55/ARW CONTINUITY CHECKING DATA

TEST CONTROL UNIT				CIRCUIT BEING CHECKED
FREQUENCY OF APPLIED TONE, KILOCYCLES	CHANNEL	DECODER RELAY CONTACT SELECTOR POSITION	NORMAL INDICATOR LIGHT CONDITION* - TONE APPLIED	
7.50	1	N.O. 2	ON	J-702-G, J
		N.O. 6	ON	J-702-H, J
8.46	2	N.O. 2	ON	J-702-K, M
		N.O. 6	ON	J-702-L, M
9.54	3	N.O. 2	ON	J-702-N, D
		N.O. 6	ON	J-702-P, D
10.76	4	N.O. 2	ON	J-703-N, R
		N.O. 6	ON	J-703-P, R
12.14	5	N.O. 2	ON	J-703-S, R
		N.O. 6	ON	J-703-T, R
13.70	6	N.O. 2	ON	J-703-D, F
		N.O. 6	ON	J-703-E, F
15.45	7	N.O. 2	ON	J-703-G, L
		N.O. 6	ON	J-703-H, L
17.43	8	N.O. 2	ON	J-702E & J-703L
		N.O. 6	ON	J-703-C, L
19.66	9	N.O. 2	ON	J-702B & J-703K
		N.O. 6	ON	J-702A & J-703K
22.17	10	N.O. 2	ON	J-702C & J-703K
		N.O. 6	ON	J-702F & J-703K

*Indicator light ON indicates that the contacts listed in the next column to the right show continuity.

r. Maintaining any five tones on continuously, apply each of the remaining five tones one at a time and note whether the corresponding indicator lights respond in both the N.O. 2 and N.O. 6 positions of the DECODER RELAY CONTACT SELECTOR.

s. Repeat the procedure in step r, above, using different combinations of five tones so that all control channels may be tested for operation.

5-19. CHECKING DECODER CHANNEL FREQUENCIES. The various channel frequencies of Audio Decoder KY-55/ARW are subject to drifting because of aging and progressive failure of components. The channel frequencies should, therefore, be checked during the major inspection to determine whether they are within the proper limits for successful operation under all conditions. Connect the test equipment as shown in figure 5-3. Meter R16AN-USM26HWP is used to calibrate Signal Generator TS-382/U inasmuch as the signal generator cannot be set as accurately as prescribed below. Do not remove the cabinet.

a. Operate POWER switch on the Test Control Unit to ON. Allow the equipment to warm up for 5 minutes.

b. Connect Voltmeter TS-375/U between the DECODER CATHODE BIAS jacks on the Test Control Unit. Operate TEST-NORMAL switch to TEST.

c. Tune Signal Generator SG-50/ARW to receiver channel frequency. Be sure that receiver is tuned to the same channel (see paragraph 3-6 for tuning procedure).

d. Set Signal Generator SG-50/ARW for 100,000 microvolts output.

e. Rotate EXT. MOD. control on Signal Generator SG-50/ARW to 20,000 OHMS and energize Signal Generator TS-382A/U.

f. Tune Signal Generator TS-382A/U to approximate frequency of channel (see table XII). Sweep frequency to obtain maximum reading on Electronic Multimeter ME-6A/U.

g. Adjust DEVIATION control on Signal Generator SG-50/ARW to obtain exactly 3 volts on Electronic Multimeter ME-6A/U when audio frequency is set for maximum reading (as outlined in step f.).

h. Keeping Signal Generator SG-50/ARW control settings the same, sweep frequency of Signal Generator TS-382A/U each side to obtain exactly 1.5 volts on Electronic Multimeter ME-6A/U.

i. Add the two frequencies so obtained and divide by two. The frequency obtained should be within the limits stated in table XII.

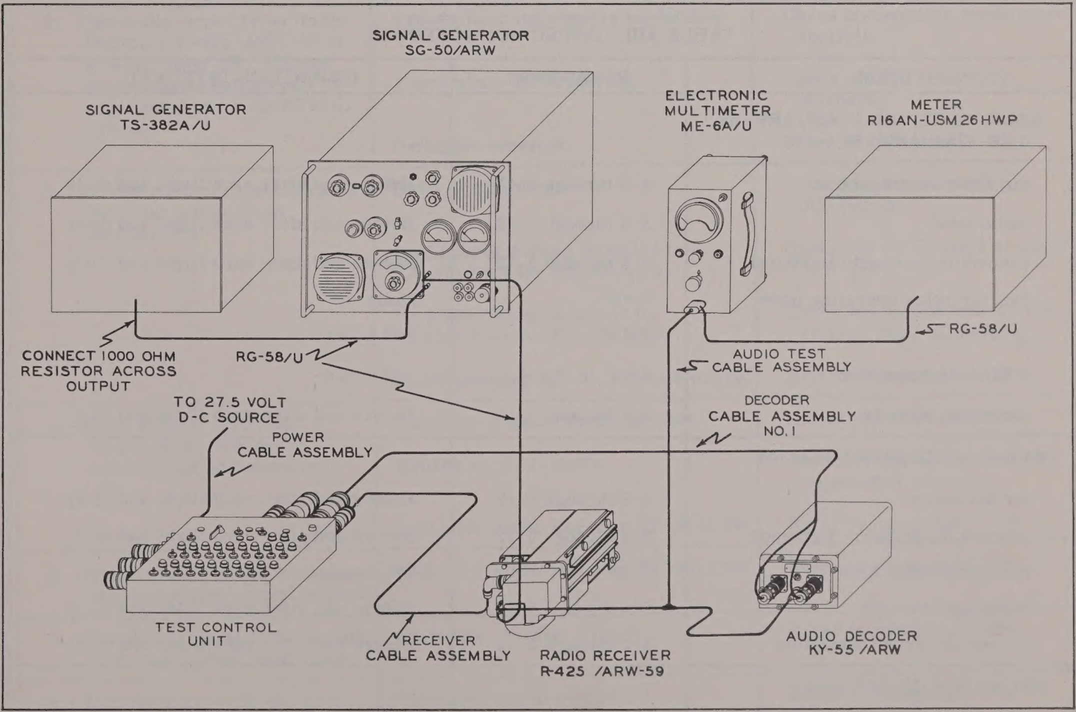

SIGNAL GENERATOR SG-50/ARW
SIGNAL GENERATOR TS-382A/U
ELECTRONIC MULTIMETER ME-6A/U
METER R16AN-USM26HWP
RG-58/U
CONNECT 1000 OHM RESISTOR ACROSS OUTPUT
RG-58/U
AUDIO TEST CABLE ASSEMBLY
TO 27.5 VOLT D-C SOURCE
DECODER CABLE ASSEMBLY NO. 1
POWER CABLE ASSEMBLY
TEST CONTROL UNIT
RECEIVER CABLE ASSEMBLY
RADIO RECEIVER R-425 /ARW-59
AUDIO DECODER KY-55 /ARW

Figure 5-3. Test Setup for Checking Decoder Channel Frequencies

TABLE XII. AUDIO DECODER KY-55/ARW CHANNEL FREQUENCIES

CHANNEL NUMBER	CHANNEL FREQUENCY KC/S	LOWER FREQUENCY LIMIT KC/S	UPPER FREQUENCY LIMIT KC/S
1	7.500	7.477	7.523
2	8.460	8.435	8.485
3	9.540	9.511	9.569
4	10.760	10.728	10.792
5	12.140	12.104	12.176
6	13.700	13.659	13.741
7	15.450	15.404	15.496
8	17.430	17.378	17.482
9	19.660	19.601	19.719
10	22.170	22.103	22.237

5-20. INSPECTION SCHEDULE.

5-21. Table XIII summarizes the preflight, postflight, daily, and major inspections. The various items requiring inspection are listed opposite the recommended inspection interval and the number of the paragraph which describes the inspection procedure.

TABLE XIII. INSPECTION SCHEDULE

ITEM	PARAGRAPH	INSPECTION INTERVAL
RADIO RECEIVER R-425/ARW-59 or R-425A/ARW-59		
air pressure of cabinet	5-5 through 5-12	Before and after each flight and daily
audio level	5-5 through 5-12	Before and after each flight and daily
connectors properly tightened	5-5 through 5-12	Before and after each flight and daily
carrier relay operating point	5-10	Daily
dynamotor	5-13	100 hours
electrical inspection	5-13	100 hours
mounting security	5-5 through 5-12	Before and after each flight and daily
AUDIO DECODER KY-55/ARW		
air pressure	5-5 through 5-12	Before and after each flight and daily
connectors properly tightened	5-5 through 5-12	Before and after each flight and daily
electrical inspection	5-13	100 hours
mounting security	5-5 through 5-12	Before and after each flight and daily
proper electrical operation	5-5 through 5-12	Before and after each flight and daily
MOUNTING MT-950/ARW		
freedom of movement	5-5 through 5-12	Before and after each flight and daily
safety wiring	5-5 through 5-12	Before and after each flight and daily

5-22. TROUBLE ANALYSIS.

5-23. INTRODUCTION. The following text material provides a means of tracing any equipment faults to the malfunctioning component.

5-24. SYSTEM TROUBLE ANALYSIS. Frequently repair may be effected without removing the equipment from the aircraft. It is therefore suggested that an inspection similar to the daily inspection (paragraphs 5-10, 5-11, and 5-12) be given the equipment to determine the nature of the trouble. The symptoms should be checked against the system trouble analysis chart below to discover the possible causes. The various causes should be systematically checked until it is established that the trouble cannot be repaired without recourse to the test bench and test equipment. The equipment may then be removed from the aircraft.

TABLE XIV. SYSTEM TROUBLE ANALYSIS

SYMPTOMS	POSSIBLE CAUSES	PROCEDURE
1. No audio output from Radio Receiver R-425/ARW-59 or R-425A/ARW-59	No input power applied to receiver.	Check primary power source voltage.
	Defective power input cabling.	Check voltage at pin G of plug P-603.
	Defective antenna cable.	Check for continuity and/or shorts to ground.
	Transmitting equipment not operating or not being modulated.	Check transmitting equipment.
	Receiver inoperative.	Refer to paragraph 5-25.
2. Low audio output from Radio Receiver R-425/ARW-59 or R-425A/ARW-59. Cannot be increased sufficiently by adjustment of AF CONTROL (R-603)	Transmitter improperly modulated.	Check transmitter modulation controls.
	Transmitter off frequency.	Check against frequency standard.
	Defective receiver.	Refer to paragraph 5-25.
3. No control functions operative. Receiver audio output satisfactory	Defective cabling.	Look for obvious cabling difficulties.
	No filament voltage supplied to Audio Decoder KY-55/ARW	Check for 24-29 volts at pin B of P-703.
	No plate voltage supplied to Audio Decoder KY-55/ARW.	Check for approximately 128 volts at pin J of P-703.
	Audio Decoder KY-55/ARW defective.	Refer to paragraph 5-25.
4. Some control functions inoperative. Receiver audio output satisfactory.	Insecure plugs on audio decoder.	Hand tighten all plugs.
	Broken wires in cable.	Check wiring associated with inoperative functions.
	Defective Audio Decoder KY-55/ARW.	Refer to paragraph 5-25.
5. Some or all control functions operate without signal applied.	Defective Audio Decoder KY-55/ARW.	Refer to paragraph 5-25.
6. Carrier relay will not operate at proper signal input value.	Defective receiver circuit.	Refer to paragraph 5-25.
7. Carrier relay will not open when signal input is removed.	Defective receiver circuit.	Refer to paragraph 5-25.

5-25. TROUBLE CORRECTION. If the above paragraphs indicate that either Audio Decoder KY-55/ARW or Radio Receiver R-425/ARW-59 is operating improperly, the unit should be tagged to indicate the nature of the fault and turned over to Field and FASRON maintenance personnel. Trouble location within the two units requires the use of a test bench, test equipment and extensive analysis procedures. Trouble location is described in section VI, Field and FASRON Maintenance.

5-26. MINIMUM PERFORMANCE STANDARDS.

5-27. Table XV summarizes the information contained in the major inspection procedure. The table presents a set of standards which establishes the minimum acceptable performance of Radio Receiver R-425/ARW-59 or R-425A/ARW-59 and Audio Decoder KY-55/ARW. The paragraph that describes the procedure to be followed for each of the tests is listed in the proper column.

TABLE XV. MINIMUM ACCEPTABLE PERFORMANCE

RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59			
FUNCTION	SPECIAL CONDITIONS	INDICATION	PARAGRAPH
Carrier Relay Closure	CARRIER CONTROL R-601 fully clockwise	Not more than 1 uv input to cause closure	5-18 e
	CARRIER CONTROL R-601 fully counterclockwise	Not less than 100 uv input to cause closure	5-18 e
First Limiter Grid	3 uv input	Approx. -2.0 V	5-18 f
	No input	Approx. -1.5 V	5-18 g
Modulation-On-to-Modulation-Off AF Output voltage ratio (S/N ratio)	R-f input, 5 uv	6 db or greater (Ballantine Voltmeter 300)	5-18 i
Audio Output	AF CONTROL R-603 fully counterclockwise	0.35 V or less	5-18 k
Audio Distortion	R-f input 1000 uv	Less than 5 percent rms	5-18 m
Limiter Saturation	R-f input - Approx. 10 uv	Corresponds to approx. 1 V rms audio output	5-18 j
Band Pass	6 db	665 kc	5-18 n
AUDIO DECODER KY-55/ARW			
Control Functions Operative		Relay closes on application of proper signal	5-18 n thru 5-18 s
Channel Frequencies		Center of 6 db bandwidth within ±0.3 percent	5-19

5-28. LUBRICATION.

5-29. No lubrication of Radio Receiving Set AN/ARW-59 is required except at designated overhaul periods. The blower, B-601, and the dynamotor, D-601, require lubrication only when overhauled. The tuning mechanisms of the r-f amplifier and first i-f amplifier must be lubricated with MIL-G-3278 grease if they have been disassembled. Audio Decoder KY-55/ARW contains no moving parts. Consequently, no lubrication is required.

5-30. OVERHAUL SCHEDULE.

5-31. The following components of Radio Receiver R-425/ARW-59 or R-425A/ARW-59 should be overhauled at regular intervals; no other components of Radio Receiving Set AN/ARW-59 or Audio Decoder KY-55/ARW require overhaul.

TABLE XVI. OVERHAUL SCHEDULE

COMPONENT	OVERHAUL INTERVAL
Dynamotor D-601	Every 200 hours of operation
Blower, B-601	Every 200 hours of operation

SECTION VI
FIELD MAINTENANCE

6-1. INTRODUCTION.

6-2. This section is concerned with the maintenance of this equipment by Field and FASRON maintenance activities. Trouble analysis procedures, subassembly replacement routines and test procedures are included in this section to assist maintenance personnel in restoring the equipment to proper working order. The maintenance man should refer liberally to the diagrams in section VII. These diagrams will aid in identifying circuits and locating test points.

6-3. TROUBLE ANALYSIS.

6-4. GENERAL.

6-5. The procedure followed in the trouble isolation scheme below is that of first isolating the defect to the offending circuit or subassembly, and then tracing the defective circuit to identify the part that is causing the difficulty. It is assumed that a general idea of the nature of the defect and its symptoms has been obtained from system trouble analysis procedures given in section V. If the symptoms of the defect have not been determined, a series of tests similar to those described in paragraphs 5-22 through 5-28 should be given the equipment.

6-6. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59 TROUBLE ISOLATION.

6-7. GENERAL. The following procedure will aid in isolating the defect to an easily replaceable subassembly. The defective subassembly may then be removed from the receiver and the receiver restored to action by replacing the subassembly with a properly functioning unit. Defective subassemblies may be restored to proper operation and used to expedite the servicing of other defective receivers. The procedures applicable to the removal, reinstallation and adjustment of the various subassemblies follow in paragraphs 6-39 through 6-66.

NOTE

> The following trouble isolation and alignment procedures apply equally to Radio Receiver R-425/ARW-59 and R-425A/ARW-59 unless otherwise specified.

6-8. TEST EQUIPMENT. The following test equipment must be available to complete the receiver trouble isolation procedure:

a. Signal Generator SG-50/ARW.

b. Electronic Multimeter ME-6A/U.

c. Test Bench Cable Set AN/ARM-15.

d. Voltmeter TS-375/U.

e. Multimeter TS-352/U.

6-9. PROCEDURE. Connect the receiver as indicated in figure 5-2. Audio Decoder KY-55/ARW is shown connected to the audio output cable to serve as a load for the receiver. If desired, the Dummy AF Load may be used in place of Audio Decoder KY-55/ARW. Remove the cabinet from the receiver. Operate POWER switch on the Test Control Unit to the ON position and wait 5 minutes for the equipment to reach operating temperature. Connect Multimeter TS-352/U between either 28 V DECODER TEST POINT and ground. Adjust input voltage for an indication of 27.5 volts. Maintain voltage at this value through subsequent procedures.

a. Check the audio output voltage at test point ☆2 (J-602, AUDIO OUTPUT) by means of the following procedure. Refer to figure 6-10 to locate test points involved in this procedure.

1. Tune Signal Generator SG-50/ARW to the channel frequency of the receiver. Turn the modulation control to 1000 cycles, and set the deviation control to 120 kilocycles. Increase the output amplitude to 200 microvolts.

2. Rotate the AF CONTROL, R-603, to the full counterclockwise position. Refer to figure 6-4. The indication on Electronic Multimeter ME-6A/U should now be 0.35-volt rms or less.

3. Rotate the AF CONTROL, R-603, to the full clockwise position. The indication on Electronic Multimeter ME-6A/U should now be more than 1.0-volt rms.

b. If indications in steps 2 and 3 above, are normal the audio circuits are operating satisfactorily. Continue with paragraphs c through g, below.

c. Check for normal carrier relay (K-601) operation by means of the procedure below:

1. Turn the modulation control on Signal Generator SG-50/ARW to the OFF position. Decrease the output to zero.

2. Rotate the CARRIER CONTROL, R-601, to its full clockwise position. Refer to figure 6-4. Watch for evidence of continuity between pin B of J-603, test point ☆3, and pin E of J-603, test point ☆4, while the output of Signal Generator SG-50/ARW is slowly increased. Continuity is indicated when the CARRIER RELAY RELEASE light on the Test Control Unit goes out, and the CARRIER RELAY OPERATE light becomes illuminated. Less than 1 microvolt should be required;

also, if the carrier relay closes on zero input (noise voltage) the circuit is functioning satisfactorily.

3. Rotate the CARRIER CONTROL, R-601, to its maximum counterclockwise position. Increase the output of Signal Generator SG-50/ARW to obtain carrier relay closure. Greater than 100 microvolts should be required.

d. If step c yields satisfactory results, the carrier relay circuits are operating satisfactorily.

e. If a fault exists in the audio output, but the carrier relay is operating properly, the circuitry associated with the audio amplifier, the discriminator or the second limiter must be defective. Check the filament circuit as described in paragraphs 6-10 and 6-11 to determine whether the fault is caused by a defective tube filament. If the replacement of any faulty tubes does not correct the trouble, continue the trouble analysis by conducting procedures in paragraph 6-13.

f. If the carrier relay operation shows a defect, but the audio output range is normal, trouble probably exists in the carrier relay circuits or in the stages preceding the second limiter. Check for a defective tube filament by means of the procedure in paragraphs 6-10 and 6-11. If replacement of defective tubes does not correct the trouble, refer to paragraph 6-12.

g. Improper operation of the carrier relay combined with incorrect audio output values indicates a fault in the stages common to both the audio and carrier relay circuits. The stages preceding the second limiter are common to both circuits. Refer to paragraphs 6-10 and 6-11 for a check of the filament circuit. If this does not isolate the fault, refer to paragraph 6-12.

6-10. PLATE AND FILAMENT CHECK. Check the plate and filament circuits for the proper voltage values by the procedure below: Connect the equipment as shown in figure 5-2. Signal Generator SG-50/ARW and Audio Coder KY-51/ARW need not be connected. Refer to figure 6-5 for location of test points.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	⑦ E-605	TS-352/U connected from test point to ground and set to read volts. POWER switch on Test Control Unit in ON position.		24-29 volts.	Proceed with step 2.	Power source inoperative or disconnected. Blown fuse in Test Control Unit. Fuse may have blown due to shorted filaments (see paragraph 6-11) or shorted dynamotor input.
2	⑥ C-614C	Same as step 1. Connect Audio Decoder KY-55/ARW to serve as load for dynamotor.		Approx. 128 volts.	Proceed with paragraph 6-11.	Defective dynamotor output. Short in plate circuits of receiver of decoder. Shorted filter capacitor C-614C.

6-11. Check the filament circuit by means of voltage and resistance measurements. This will determine whether the filament circuit is properly balanced. With the input voltage turned off, check the resistance from each test point (in the list below) to ground. Refer to figure 7-6 for location of test points. If no serious discrepancies are noted, energize the input voltage source and set it to provide 27.5-volts dc. Check the voltage from each test point to ground as rapidly as possible.

TEST POINT	RESISTANCE	VOLTAGE
Ⓐ, V-503-5 tie point	0.8	27.5
Ⓑ, terminal H of r-f amplifier	1.4	21.3
Ⓒ, terminal H of first oscillator	1.4	21.3
Ⓓ, R-511, R-504 tie point	1.4	21.3
Ⓔ, R-510, R-511 tie point	1.7	15.0
Ⓕ, R-513 tie point	0.8	6.3
Ⓧ, Junction of R-513 and R-510	2.8	8.7

If trouble should be indicated by the voltage and resistance measurements, the input voltage source should be turned off and trouble analysis continued by applying a 6-volt dc source across each parallel filament string. Refer to figure 7-6. Connect the 6-volt source, in turn, across each of the following test point combinations and check the filaments listed opposite to see that they are all properly lighted. The filaments may be most readily observed in a dark room by viewing the bases of the tubes.

CONNECT ACROSS TEST POINT	OBSERVE THE FILAMENTS OF THESE UNITS:
Ⓐ , Ⓓ	First oscillator, r-f amplifier
Ⓓ , Ⓔ	First i-f amplifier
Ⓔ , Ⓧ	Audio and carrier relay board
Ⓕ , ground	Second i-f amplifier

6-12. FAULTY CARRIER RELAY OPERATION. If the carrier relay (K-601) fails to operate normally, the stages preceding the second limiter, the carrier relay amplifiers or the carrier relay itself may be at fault. If the carrier relay closes at a satisfactory value but fails to open normally, the fault is probably excessive noise in the r-f amplifier or first mixer circuits. This may be checked by setting the CARRIER CONTROL (R-601) so that the carrier relay will close when 3 microvolts of r-f signal is applied and noting the voltage between test point ★8 (figure 6-6) and ground using Multimeter TS-352/U. If a voltage of approximately 4 volts is obtained, the trouble is probably excessive noise in the r-f amplifier or first mixer stages. The dynamotor, or the dynamotor filter capacitor C-614, may allow noise voltages to interfere with the receiving circuits. If the carrier relay fails to operate properly, in any manner other than that described above, conduct the following trouble analysis procedure: Connect equipment in accordance with figure 5-2. Refer to figures at the rear of this section to locate test points.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 OR R-425A/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	★3 pin B of J-603	On SG-50/ARW, turn modulation control OFF. Tune to receiver frequency and set amplitude to 3 uv.	Adjust CARRIER CONTROL R-601 so that relay just closes at this amplitude.	Adjustment can be made.	Continue with step 2.	Continue with step 3.
2	★5 J-503 ★8 E-201	Same as step 1. Also connect TS-375/U between test point ★5 and ground, and connect TS-352/U between test point ★8 and ground.		Approx. -2.5 volts at test point ★5. Approx. 3 volts at test point ★8.	If indications in steps 1 and 2 are normal, the receiver circuits are probably satisfactory but the CARRIER CONTROL is in need of adjustment.	Trouble in stages preceding second limiter. Continue with step 4.
		Same as step 2 above, except turn SG-50/ARW output to zero.		Approx. -1.5 volts at test point ★5. Approx. 3 volts at test point ★8.		
3	★5 J-503 ★8 E-201	Same as step 2, (top portion).	Adjust CARRIER CONTROL R-601 to obtain -2.5 volts at test point ★5	Approx. 3 volts at test point ★8.	Proceed with step 4.	Trouble in stages preceding second limiter. Continue with step 5.
		Same as step 2, (bottom portion).	Same as step 3 part 1.	Approx. -1.5 volts at test point ★5		

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 OR R-425A/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
4	★⑩ V-503-8	Increase SG-50/ARW signal amplitude to a value greater than 200 uv. Connect TS-375/U between test point and ground.		Approx. 110 volts.	Normal indication or more with carrier relay not closed indicates a defective K-601; if relay closes continue with step 6.	K-601 or V-503 defective. Proceed with step 5.
5	★⑨ R-507 tie point ★⑩ V-503-8	Connect TS-352/U between test points.	Turn off input power to receiver.	7,000 to 12,000 ohms.	V-503 is probably defective.	K-601 is defective.
6	★⑪ E-120	Turn SG-50/ARW output to zero. Connect TS-375/U from test point to ground.		-0.9 volt (or more negative).	Proceed with step 7.	First oscillator or V-102 (first mixer) is defective.
7	★⑪ E-120	Increase SG-50/ARW output to 50,000 uv. Connect TS-375/U from test point to ground. After taking reading, change signal level to 100,000 uv. Take second reading of TS-375/U.	Remove crystal Y-401 to disable first oscillator.	Voltage should change at least 0.5 volt but not over 1.0 volt i.e., the gain should be between 10 and 20.	Proceed with step 8.	R-f amplifier subassembly is defective or is in need of alignment.
8	★⑫ E-211	Turn SG-50/ARW output to zero. Connect TS-375/U from test point to ground.	Replace Y-401 in first oscillator.	Not less than -0.5 volt.	Proceed with step 9.	Second oscillator in first i-f amplifier subassembly is defective.
	★⑬ E-212	Same as step 8 (part 1).	Same as step 8 part 1.	Approx. -2.5 volts.		
9	★⑫ E-211	Connect TS-375/U to test point. Slowly increase SG-50/ARW output from 0 uv to 100,000 uv.	Remove the second oscillator crystal (Y-201 to Y-215).	Voltage will start at approx. -0.3 volt and increase to approx. -2.0 volts.	Continue with part 2.	Defective amplifiers in the first i-f amplifier subassembly.
	★⑧ E-201	Connect TS-352/U from test point ★⑧ to ground.	Adjust CARRIER CONTROL R-601 to secure indication at right.	Approx. 3 volts.	Continue with part 3.	

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 OR R-425A/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
9 (cont)	★12 E-211	Turn SG-50/ARW output to 10,000 uv. Connect TS-375/U between test point ★12 and ground. Read meter, then increase SG-50/ARW output to cause voltage at test point ★12 to go 0.5 volt more negative.		SG-50/ARW output should be increased by 15,000 uv or less.	Continue with step 9.	
10	★8 E-201	Connect TS-352/U between test point and ground.	Crystal Y-401 must be replaced in first mixer. Adjust CARRIER CONTROL R-601 to secure indication at right.	Approx. 3 volts.	Continue with step 9, part 2.	Defective amplifiers in second i-f amplifier subassembly.
	★5 J-503	Set SG-50/ARW output to 3 uv. Connect TS-375/U between test point ★5 and ground.		-2.5 volts approx.	Continue with step 9, part 3.	
	★5 J-503	Turn SG-50/ARW output to zero.		-1.5 volts approx.	Carrier relay circuits are probably satisfactory.	

6-13. FAULTY AUDIO OUTPUT CIRCUIT OPERATION. If trouble exists in the audio circuits, as determined by faulty audio output values, the trouble is in either the discriminator section of the second i-f amplifier, or the audio and carrier relay board. The procedure below will isolate the defect to the malfunctioning subassembly. Incorrect deviation or incorrect output frequency at Signal Generator SG-50/ARW may also cause incorrect audio output. Consequently, these two possibilities should be fully investigated before proceeding with the trouble isolation system below. Connect equipment according to figure 5-2. Set Signal Generator SG-50/ARW to the receiver frequency.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 OR R-425A/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	★14 E-319	Rotate modulation control to 1000 ~ on SG-50/ARW. Set DEVIATION for 120 kc. Set output to 200 microvolts. Connect ME-6A/U between test point and ground.		1.6 volts rms.	Proceed with step 2.	Discriminator circuits in second i-f amplifier are in need of alignment or repair.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	R-425/ARW-59 OR R-425A/ARW-59 CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
2	★⑮ J-502	Same as step 1 except that ME-6A/U connects between test point ★⑮ and ground.	Turn AF CONTROL R-603 to maximum clockwise position.	1.4 volts rms.	Proceed with step 3.	AF CONTROL, R-603, or resistor R-604 defective.
3	★⑯ V-501-2, 4 and 8	Same as step 1. Note that ME-6A/U should now connect between test point ★⑯ and ground.	Same as step 2.	1.2 volts rms.	Proceed with step 4.	Defective audio output stage on audio board.
4	★② AUDIO OUT-PUT J-602	Same as above except ME-6A/U now connects between test point ★② and ground.	Same as step 2.	1.0 volt rms.	Audio circuits probably satisfactory.	Defective carrier relay K-601. Broken wiring between V-501-2 and J-602.

6-14. RECEIVER SUBASSEMBLY TROUBLE ANALYSIS.

6-15. GENERAL. In the following trouble analysis procedures, much of the information is given in the form of tabular material. These tables correlate the effects observed with the faults that may possibly cause them. It should be emphasized that the faults listed do not represent all the faults which may cause any one condition, but only represent the most probable sources of trouble. A thorough understanding of the circuit is indispensable when dealing with unusual conditions.

6-16. VOLTAGE AND RESISTANCE MEASUREMENTS. The voltage and resistance measurements given in the trouble shooting procedures that follow are typical values. Individual units may vary from the values stated and still function properly. However, large variations are usually indicative of trouble and the faults associated with each abnormal indication should be investigated. The tubes used in Radio Receiver R-425/ARW-59 and R-425A/ARW-59 are subminiature types. These tubes have wire leads which are difficult to identify on an assembled equipment. Figures 7-9 through 7-15 locate the tie points of each tube lead and present the typical voltage and resistance measurements at each point. Tables XVII through XXI list the possible causes of abnormal values of voltage and resistance. Unless otherwise stated, subassemblies are to be mounted upon a receiver chassis and connected to simulate operating conditions. The receiver chassis should contain all the subassemblies of a complete receiver to obtain proper filament voltage distribution and no subassembly should be removed from the chassis while the receiver is energized. No signal should be applied to the receiver while voltage measurements are being taken. The receiver should be disconnected from all power sources when measuring resistance.

6-17. R-F AMPLIFIER. Trouble is most easily located within the r-f amplifier subassembly by measuring voltage and resistance at the tube terminals. The proper voltage and resistance measurements, and a list of probable causes of abnormal indication are given in table XVII and figures 7-9 and 7-10. Figures 7-2 or 7-3 should be used for reference to aid in locating the faulty component. The probable faults listed in table XVII should be systematically investigated until the defect is located. If the r-f amplifier voltage and resistance measurements show no abnormalities, the trouble may be narrow band-pass characteristics or low gain. The alignment procedures in paragraph 6-55 may be all that is required to make the subassembly serviceable.

TABLE XVII. R-F AMPLIFIER TROUBLE ANALYSIS

TUBE PIN	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-101-1	R-101. Grid to cathode short in V-101.
V-101-2 V-101-4 V-101-8	R-102, C-105, C-106, R-109, C-111, C-130.
V-101-3 V-101-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-101-5	R-109, C-111, C-130. Z-103 off resonance. No plate supply voltage. Short in V-101.
V-101-7	P-110, C-111, C-130, C-116. No plate supply voltage. Short in V-101.
V-102-1	R-104, C-114. Grid to cathode short in V-102.
V-102-2 V-102-4 V-102-8	R-105, C-117, C-118. E-213 not connected.
V-102-3 V-102-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-102-5	R-202. No plate supply voltage to first i-f amplifier subassembly.
V-102-7	R-107. R-106, C-119, C-111, C-130. No plate supply voltage.

6-18. FIRST OSCILLATOR. Trouble analysis in the first oscillator may be accomplished by use of the same voltage and resistance measurement technique used in the r-f amplifier. Refer to table XVIII and figure 7-11. Figures 7-2, 7-3 or 7-6 should be used for reference.

TABLE XVIII. FIRST OSCILLATOR TROUBLE ANALYSIS

TUBE PIN	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-401-1	R-410 grid to cathode short in V-401.
V-401-3 V-401-6 V-402-3 V-402-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-401-5	R-401, R-402.
V-401-8	L-401 and C-401, C-402, C-407. No plate voltage.
V-402-1	R-403.
V-402-5	R-401, R-402.
V-402-8	L-402, R-411, C-407, C-402, C-404, C-405. No plate voltage. Short in V-402.
V-403-1	L-107, C-111, C-130, C-410. No plate voltage.
V-403-2	C-409B, R-405, No plate voltage.
V-403-3 V-403-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-403-5	Improper ground connection.
V-403-6	R-408. C-409A.
V-403-7	R-406.

6-19. FIRST I-F AMPLIFIER. First i-f amplifier troubles are divided into two general categories; those faults that affect the three first i-f amplifiers and the second mixer stages, and those defects that cause improper operation of the second oscillator. The first group of troubles may be resolved by taking voltage and resistance measurements on V-201, V-202, V-203 and V-204. The second group of troubles may be analyzed by taking voltage and resistance measurements of V-205 and V-206. The correct measurements and a list of probable causes of abnormal readings are given in table XIX and figure 7-12. Refer to figure 7-2, 7-3, or 7-6.

TABLE XIX. FIRST I-F AMPLIFIER TROUBLE ANALYSIS

TUBE PIN	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-201-1	R-207. C-212. C-242. C-243. C-236. No plate voltage. Short in V-201.
V-201-2	C-212. R-207. C-242. C-243. C-236. No plate voltage. R-233.
V-201-3 V-201-4	Filament circuit faulty. Refer to paragraph 6-10 and figure 7-6.
V-201-5	Faulty ground connection.
V-201-6	R-228. C-207. L-207 through L-209. R-205. R-601.
V-201-7	R-204. C-206. R-203. C-204.
V-202-1	R-212. C-219. C-242. C-243. C-236. No plate voltage. Plate to suppressor grid short in V-202.
V-202-2	C-219. R-212. C-242. C-243. C-236. No plate voltage. R-234.
V-202-3 V-202-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-202-5	Faulty ground connection.
V-202-6	R-229. C-214. L-208. L-209. R-205.
V-202-7	R-209. C-213. R-203. R-208. C-211.
V-203-1	R-217. C-242. C-226. C-243. C-236. No plate voltage. Plate to suppressor grid short.
V-203-2	C-226. R-217. C-242. C-243. C-236. No plate voltage. R-235.
V-203-3 V-203-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-203-5	Faulty ground connection.
V-203-6	R-230. C-221. L-209. R-205.
V-203-7	R-214. C-220. R-213. R-208. C-218.
V-204-1	Improper connection J-201, J-606A, J-606B, or P-301. L-301. C-301. No plate voltage to second i-f amplifier. Plate to suppressor grid short.
V-204-2	R-232. R-220. C-228. C-242. C-243. C-236. No plate supply voltage.
V-204-3 V-204-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-204-5	Faulty ground connection.
V-204-6	R-219. C-227.
V-204-7	R-218. C-226.

TABLE XIX. FIRST I-F AMPLIFIER TROUBLE ANALYSIS (Cont.)

TUBE PIN	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-205-1	Faulty ground connection.
V-205-3 V-205-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-205-5	R-223. L-206. R-224.
V-205-8	L-205. C-229. R-221. C-243. C-242. C-236. No plate supply voltage. C-232.
V-206-1	R-225. C-232.
V-206-3 V-206-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-206-5	R-224. L-206. R-223.
V-206-8	C-231. R-221, C-242. C-243. C-236. No plate supply voltage.

6-20. SECOND I-F AMPLIFIER. Trouble in the second i-f amplifier can be conveniently divided into two categories. The first category includes all troubles that cause improper carrier relay operation and abnormal first limiter grid voltages. These troubles must fall within the fixed i-f amplifier stages, V-301, V-302, V-303, and V-304. The second category includes faults that cause abnormal audio output. These faults must be within the limiter and discriminator stages, V-305, V-306, V-307, and V-308. The latter category may be split into two subgroups by noting whether the audio output from the second i-f amplifier varies in proportion to the signal input amplitude (above 6 microvolts). If the audio output varies as stated above, the fault is probably within the limiter stages, V-305 and V-306.

6-21. The various stages may be checked by comparing observed voltages and resistances with the typical values given in figure 7-13. Possible causes of abnormal measurements are identified in table XX. The measurements below are taken with the AF CONTROL, R-603, in its maximum clockwise position. The second i-f amplifier should be removed from its normal position in the receiver chassis. Plug P-301 should be engaged with jack J-604 to supply proper operating voltages.

NOTE

Do not operate the equipment for any longer time than necessary when the second i-f amplifier is in this condition. This procedure removes plate voltage from V-204 and causes abnormally high screen current in the tube. If the second i-f amplifier is to be left in the condition described above, a connection should be made between J-301 and J-606B. Two connectors and a short length of cable will facilitate this connection.

The shield should not be removed from the second i-f amplifier while checking voltages. The unit will oscillate when the shield is removed and some of the measurements obtained will not be usable. Consequently, voltages may be measured only at the test points accessible from the bottom side of the unit. Refer to figure 7-13. Resistance measurements must be made with no power applied to the receiver and the second i-f amplifier connected as described for the voltage measurements, above. The connection between J-301 and J-606B may be omitted. Resistance measurements may be taken with the shield removed.

TABLE XX. SECOND I-F AMPLIFIER TROUBLE ANALYSIS

POINT OF MEASUREMENT	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-301-1	L-302.
V-301-2 V-301-4 V-301-8	E-333. C-305. C-307. L-316. L-315. R-324 through R-327. R-602.
V-301-3 V-301-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-301-5	C-308. R-330 through R-332. L-319. C-353. No plate supply voltage.

TABLE XX. SECOND I-F AMPLIFIER TROUBLE ANALYSIS (Cont.)

POINT OF MEASUREMENT	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-301-7	C-306. R-303. C-308. R-330 through R-332. L-319. C-353. No plate supply voltage.
V-302-1	L-304.
V-302-2 V-302-4 V-302-8	C-312. C-314. L-316. L-315. R-324 through R-327. R-602.
V-302-3 V-302-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-302-5	C-315. L-305. R-330. R-331. L-319. C-353. No plate supply voltage.
V-302-7	C-313. R-306. C-315. R-330. R-331. L-319. C-353. No plate supply voltage.
V-303-1	L-306.
V-303-2 V-303-4 V-303-8	C-319. C-321. L-315. R-324 through R-327. R-602.
V-303-3 V-303-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-303-5	C-322. L-307. R-330. L-319. C-353. No plate supply voltage.
V-303-7	C-320. R-309. C-322. R-330. L-319. C-353. No plate supply voltage.
V-304-1	L-308.
V-304-2 V-304-4 V-304-8	C-326. C-328. R-324 through R-327. R-602.
V-304-3 V-304-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-304-5	C-329. L-309. L-319. C-353. No plate supply voltage.
V-304-7	C-327. R-312. C-329. L-319. C-353. No plate supply voltage.
V-305-1	Grid to cathode short in V-305.
V-305-2 V-305-4 V-305-8	Faulty ground connection.
V-305-3 V-305-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-305-5	C-337. R-318. R-315. R-335. C-353. No plate supply voltage.
V-305-7	C-336. R-316. C-337. R-315. R-335. C-353. No plate supply voltage.
V-306-1	R-317.
V-306-2 V-306-4 V-306-8	Faulty ground connection.
V-306-3 V-306-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-306-5	L-313. C-343. R-334. R-329. No plate supply voltage.
V-306-7	C-341. R-319. C-343. R-334. R-329. No plate supply voltage.

TABLE XX. SECOND I-F AMPLIFIER TROUBLE ANALYSIS (Cont.)

POINT OF MEASUREMENT	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-307-1	L-314. R-321.
V-307-2 V-307-3	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-307-4	R-322. R-321. C-346.
V-308-1	L-314. R-321.
V-308-2 V-308-3	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-308-4	Faulty ground connection.
C-337	R-315. R-335. C-336. V-305 not functioning properly. No plate voltage.
C-343	R-334. R-329. C-341. V-306 functioning improperly. No plate voltage.

6-22. AUDIO AND CARRIER RELAY BOARD. Trouble within the audio and carrier relay board subassembly can be divided into two classes; those defects that cause improper carrier relay operation, and those defects that affect the audio output. The first class is characterized by faults in V-502 or V-503; the second class by faults in V-501. Voltage and resistance measurements will aid in localizing the fault.

6-23. The voltage and resistance measurements and locations of the tube pin tie points for the audio and carrier relay board subassembly are given in figure 7-14. The measurements in figure 7-14 are made with a 560-ohm load, such as the Dummy AF Load connected across the output of the audio output stage, V-501. Refer to table XXI.

TABLE XXI. AUDIO AND CARRIER RELAY BOARD TROUBLE ANALYSIS

TUBE PIN	POSSIBLE CAUSE OF ABNORMAL INDICATION
V-501-1	R-506. R-501. R-503. R-502.
V-501-2 V-501-4 V-501-8	R-502. R-503. R-605 if carrier relay is open. K-601.
V-501-3 V-501-6	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-501-5 V-501-7	C-614B. R-605. C-614C. No plate supply voltage. R-505.
V-502-1	C-502. R-514. R-512. R-509.
V-502-3 V-502-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-502-5	Faulty ground connection.
V-502-8	R-507. C-614C. No plate supply voltage. Grid to cathode short.
V-503-1	R-507. C-614C. No plate supply voltage.
V-503-3 V-503-4	Faulty filament circuit. Refer to paragraph 6-10 and figure 7-6.
V-503-5	No 27.5-volt supply.
V-503-8	K-601. C-614C. No plate supply voltage.

6-24. DYNAMOTOR. If the dynamotor is suspected of improper operation, check the input and output voltages using Multimeter TS-352/U. The input voltage should be from 24 to 29 volts. If it is not, the bench power supply is defective. An output voltage that is not approximately 128 volts indicates that the dynamotor is defective or that it is overloaded. Connect Multimeter TS-352/U to measure the output current. If this current is greater than approximately 140 milliamperes (without Audio Decoder KY-55/ARW connected) the trouble is in the receiver plate circuits. Excessive dynamotor noise reflected into the receiver circuits indicates a probable defect in the dynamotor. Dynamotor noise may be checked by removing the dynamotor from the receiver and connecting it across a 650-ohm, 50-watt load. Using a Hewlett Packard 410B or a General Radio 726A, check high frequency ripple at high voltage output. Less than 1-1/2 volts ripple should be obtained. Less than 3 volts should be obtained across the primary. Measurements are taken of dynamotor without any filter components in the circuit. Excessive noise in the dynamotor may be caused by poor brushes or a shorted armature winding. A shorted armature winding will cause sluggish dynamotor rotation and decreased output voltage, and is characterized by excessive sparking at the commutator. A defective filter component (C-614C, C-612, C-613, L-606, C-616, C-614A or C-608) may allow the dynamotor noise to be conducted unsuppressed to the receiver circuits.

6-25. BLOWER (B-601). If blower, B-601, is rotating normally and supplying a substantial draft of air, it is operating satisfactorily. Defective filter capacitors C-615 and C-617, or inductor L-607, may allow noise from the blower to reach the receiving circuits.

6-26. FILTER PLUG (J-603). The filter plug, J-603, may be checked for continuity between the input and output terminals. Check for shorts between the input (or output) terminals and ground. These tests will not reveal open filter capacitors or shorted inductances within the unit. Open capacitors or shorted inductances will manifest themselves through the presence of excessive r-f energy at the terminals of J-603.

6-27. AUDIO DECODER KY-55/ARW TROUBLE ISOLATION.

6-28. GENERAL. Audio Decoder KY-55/ARW contains no detachable subassemblies. Consequently, trouble shooting in Audio Decoder KY-55/ARW consists of two processes; first, the location of the defective circuit and second, the determination of the faulty component. Trouble isolation and repair procedures must be completed before the unit may be restored to service.

6-29. TEST EQUIPMENT. The following test equipment is necessary to perform the trouble isolation procedures given below:

a. Signal Generator SG-50/ARW.

b. Test Bench Cable Set AN/ARM-15.

c. Audio Coder KY-51/ARW.

d. Radio Receiver R-425/ARW-59 or R-425A/ARW-59.

e. Multimeter TS-352/U.

f. Voltmeter TS-375/U.

g. General Radio Model 1001A.

6-30. PRELIMINARY. Connect the equipment as shown in figure 5-2. Connect Multimeter TS-352/U between the 28 V test jacks on the Test Control Unit. Set the instrument to read current and place the 27.5 V TEST-NORMAL switch on the Test Control Unit in the TEST position. Move the POWER switch to the ON position. This procedure allows measurement of the filament current of Audio Decoder KY-55/ARW.

a. A reading of approximately 600 milliamperes is considered satisfactory. If the reading differs from this value by more than 100 milliamperes, the filament supply voltage should be turned off and the circuits investigated without power. The filament trouble shooting procedure is given in paragraphs 6-31 and 6-32.

CAUTION

Do not operate Audio Decoder KY-55/ARW with improper filament current. To do so may cause the destruction of many tubes.

b. Operate the 27.5 V TEST-NORMAL switch on the Test Control Unit to the NORMAL position. Disconnect Multimeter TS-352/U and reconnect it to the B+ test jacks. Operate the B+ TEST-NORMAL switch to the TEST position. The indication on Multimeter TS-352/U is the plate current of Audio Decoder KY-55/ARW. An indication of between 25 and 60 milliamperes should be obtained. If a reading of less than 25 milliamperes appears on Multimeter TS-352/U, the trouble is probably in the cathode follower stage, V-102. Cathode follower trouble analysis procedures are given in paragraph 6-34. No plate current, or a low plate current, may also indicate a break in the plate supply wiring. A plate current of greater than 60 milliamperes is indicative of a short in the plate supply circuits. Paragraph 6-33 covers the isolation of breaks or shorts in the plate supply wiring.

c. Restore the B+ TEST-NORMAL switch on the Test Control Unit to the NORMAL position. Disconnect Multimeter TS-352/U. Check Signal Generator SG-50/ARW to see that the signal output is turned to zero. Turn DECODER RELAY CONTACT SELECTOR switch on the Test Control Unit to position N.O. 2 and note whether any of the indicator lights are on. Do the same for position N.O. 6 of the DECODER RELAY CONTACT SELECTOR switch. A lighted indicator light indicates trouble in the associated relay amplifier stage or stages (relay is closed without any operating signal). Refer to paragraph 6-36 for further trouble analysis, procedure relative to the relay amplifier circuits.

d. Energize Signal Generator SG-50/ARW and set it to the receiver frequency. Increase the output to 200 microvolts. Set the modulation control to 500 OHM EXT. MOD. Operate the CODER switches on the Test Control Unit to the ON position one at a time (refer to table XI). Check to see whether the corresponding indicator light on the Test Control Unit glows as the switch is closed. The indicator light corresponding to the applied audio tone should glow when the DECODER RELAY CONTACT SELECTOR switch is in positions N.O. 2 and N.O. 6. If a faulty indication appears, trouble exists in the associated relay amplifier or the relay itself. Refer to paragraph 6-36 for further analysis of the fault. If none of the indicator lights respond when the corresponding tone is applied, the trouble is probably in the voltage amplifier stage, V-701, or the cathode follower stage, V-702. Trouble shooting procedure for V-701 and V-702 is presented in paragraph 6-34. Operation of the wrong indicator light, or of two or more indicator lights when a single tone is applied may be caused by improperly tuned relay amplifier filters. This is especially true if the improperly operating indicator light is adjacent to the indicator light corresponding to the tone applied. Check the resonant frequency of the associated filters in accordance with paragraph 6-37.

e. Operate any 5 CODER switches on the Test Control Unit to ON. Refer to table XI. With the 5 switches ON, operate each of the remaining switches to ON, one at a time. Note whether each relay responds by checking the indicator lights on the Test Control Unit. The corresponding indicator light should glow when the DECODER RELAY CONTACT SELECTOR switch is in either position N.O. 2 or N.O. 6. Repeat using different combinations of 5 CODER switches. If any of the relays do not respond in this test, either the filter associated with the inoperative function is detuned, or the opening and closing values of the associated relay are wrong. Refer to paragraph 6-37 and check the resonant frequency of the filter. If this is within specified limits, investigate the relay amplifier circuit (paragraph 6-36).

6-31. FILAMENT CIRCUITS. A defective tube filament may often be located by inspecting the base of each tube visually to determine whether the filament is lighted. However, this requires that the equipment be energized and, if the filaments are severely unbalanced, introduces the danger of destruction of all the other tubes in the circuit. It is recommended that the following trouble analysis procedure be used to isolate the defect to a group of tubes.

CAUTION

Do not energize the equipment for any longer than necessary to locate the fault.

6-32. The electrical inspection, below, determines whether the four parallel strings of tube filaments, which are connected in series across the 27.5-volt source (see figure 7-6), are approximately equal in resistance. Proceed as shown in the chart below. If abnormalities are found, connect a 6.3-volt dc source across the suspected parallel filament string and check to see whether all tubes are lighted.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	KY-55/ARW CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Ⓙ V-708-6	Connect TS-352/U between test point and ground. Set instrument to read ohms.	Disconnected from all external equipment.	8 ohms	Proceed with step 2.	Burned out or shorted filament. R-723 faulty. Continue with step 2.
2	Ⓘ V-702-6	Same as step 1.	Same as step 1.	6 ohms	Proceed with step 3.	If step 1 is abnormal and step 2 indication is normal, V-708, V-709, V-710 and V-711 is defective.
3	Ⓗ V-701-6	Same as step 1.	Same as step 1.	5 ohms	Proceed with step 4.	If step 2 indication is abnormal and step 3 indication is normal, V-712 or V-702 is defective.
4	Ⓖ V-701-3	Same as step 1.	Same as step 1.	3 ohms	V-701, V-703, V-704 or V-705 is defective.	V-706, V-707, V-713 or R-723 is defective.

6-33. PLATE CIRCUITS. The plate circuit should be suspected if the plate current is less than 25 milliamperes or greater than 100 milliamperes. If the static plate current is less than 25 milliamperes, conduct the test point procedure in the chart below. A plate current of over 100 milliamperes indicates a probable short in the plate circuit wiring. Careful inspection of the wiring for chafed, burned, or broken insulation will probably disclose the location of the defect.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	KY-55/ARW CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Ⓚ V-702-5, 7	Connect TS-352/U, set to read volts, between test point and ground.	Connected in accordance with figure 5-2.	Voltage equal to plate supply voltage (approx. 128 volts).	Check V-702 according to paragraph 6-34.	Plate circuit wiring to V-702 is broken.

6-34. VOLTAGE AMPLIFIER AND CATHODE FOLLOWER. A fault within the voltage amplifier, V-701, or within the cathode follower, V-702, may be located by the following procedure:

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	KY-55/ARW CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Ⓛ J-701	Apply any one control tone to SG-50/ARW by operating the switch on Test Control Unit. See table XI. Set SG-50/ARW to 120 kc deviation and 200 uv output. Connect ME-6A/U between test point and ground.	Connected in accordance with figure 5-2.	Approx. 0.60 volt.	Proceed with step 2.	Test equipment or Radio Receiver R-425/ARW-59 or R-425A/ARW-59, not operating properly. Check test setup for shorts or opens. R-701 may be shorted.
2	Ⓜ V-701-1	Same as step 1.	Same as step 1.	Approx. 0.60 volt.	Continue with step 3.	C-701 is defective or pin 1 of V-701 is shorted to ground.
3	Ⓝ V-701-8	Same as step 1.	Same as step 1.	Approx. 7 volts.	Proceed with step 4.	V-701 or R-703 defective. No plate voltage to V-701.
4	Ⓞ V-702-1	Same as step 1.	Same as step 1.	Approx. 6 volts.	Proceed with step 5.	C-702 or R-705 is defective. Pin 1 of V-702 shorted to ground.
5	Ⓟ V-702-2, 4 and 8	Same as step 1.	Same as step 1.	Approx. 5 volts.	V-701 and V-702 functioning satisfactorily.	V-702 is defective or one or more series-tuned filters shorted to ground. No plate voltage.
6	Ⓦ R-726, RT-701 tie point	Disconnect TS-352/U. Same as step 1.	Same as step 1.	Approx. 2 volts.	Cathode follower operating satisfactorily.	If voltage is extremely low, there is a short in one or more series resonant filters. Refer to paragraph 6-35.

6-35. SERIES RESONANT FILTERS. The following procedure will aid in locating any shorts in the cathode follower output line. The short may be in the wiring or in any of the ten series resonant filters. Connect Electronic Multimeter ME-6A/U between test point Ⓦ (R-726, RT-701 tie point) and ground. Equipment shall be connected as in figure 5-2. Any one control shall be applied by operating any one CODER switch on the Test Control Unit to the ON position. Unsolder each filter circuit, one at a time, until the voltage indication on Electronic Multimeter ME-6A/U resumes its normal value of approximately 2 volts. Refer to figure 7-4 or 7-5 for aid in tracing the circuitry. Reconnect each filter in the circuit before removing the next.

6-36. RELAY AMPLIFIER. Audio Decoder KY-55/ARW contains ten relay amplifier stages. Each of these stages is identical to each of the other nine stages except for the frequency of a filter which is coupled to the grid of the relay amplifier stage. The operation and trouble analysis of each of these stages is identical to the others. One exception exists in the frequency of the signal which must be applied to the filters to induce relay operation. Therefore, the procedure for analyzing trouble in the 7.50-kilocycle relay amplifier, which is given below, applies equally well to any of the ten filters except for signal frequencies and symbol numbers. Figure 7-4 or 7-5 may be used to correlate the frequencies and symbols of the ten filters and their associated relay amplifier stages.

STEP	TEST POINTS	TEST EQUIPMENT CONDITIONS	KY-55/ARW CONDITIONS	NORMAL INDICATION	IF INDICATION IS NORMAL	IF INDICATION IS ABNORMAL
1	Ⓢ V-703-1	Set SG-50/ARW to 500 OHM EXT. MOD. Tune to receiver frequency. Set deviation to 120 kc. and output to 200 uv. 7.50 kc CODER switch on the Test Control Unit is in ON position. Connect ME-6A/U between test point and ground.	Connect as shown in figure 5-2.	Approx. 10 volts.	Proceed with step 2.	Trouble in audio filter. Refer to paragraph 6-37.
2	Ⓤ K-701-1	SG-50/ARW conditions same as step 1. Disconnect ME-6A/U. Connect TS-352/U between test point and ground.	Same as step 1.	Approx. 128 volts.	Proceed with step 3.	No plate voltage or break in plate wiring.
3	Ⓥ V-703-5	Same as step 2.	Same as step 1.	Approx. 9 volts.	Proceed with step 4.	Wiring in cathode circuit open or R-727, R-728 or R-729 defective.
4	Ⓣ V-703-8	Same as step 2.	Same as step 1.	80-90 volts.	Proceed with step 5.	K-701 is open if there is no voltage. If voltage is appr approx. 128 volts, K-701 and/or V-703 is probably defective.
5	Indicator lights on Test Control Unit	SG-50/ARW set as in step 1.	Same as step 1. Also short pin 8 of V-703 to ground momentarily.	Indicator lights flash on.	Wiring between relay and plugs J-702 and J-703 is open or C-705 is defective.	K-701 is defective.

6-37. AUDIO FILTERS. Check the frequency of any suspected audio filter as described in paragraph 5-19. The filter should be tuned within the frequency limits given in table XII. If it is not, it must be retuned. Filter tuning procedure is described in paragraph 6-71. If no resonant frequency can be found for the audio filter in question, one of the filter inductors is probably open. Check the continuity of the suspected inductor.

6-38. VOLTAGE AND RESISTANCE MEASUREMENTS. A table of voltage and resistance measurements is given in figure 7-15 to aid in isolating obscure troubles. The table gives voltage and resistance measurements taken with a 20,000 ohms-per-volt and vacuum tube voltmeter at the terminals of each tube of Audio Decoder KY-55/ARW. The tie point of each tube pin is identified in the associated diagram. The measurements in figure 7-15 are typical values. Individual units may deviate from these values by as much as 20 percent and still operate effectively.

6-39. REMOVAL OF MAJOR SUBASSEMBLIES.

6-40. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59.

6-41. GENERAL. The following procedures are recommended for effecting the removal of subassemblies from Radio Receiver R-425/ARW-59 or R-425A/ARW-59. The primary power source should be disconnected before attempting the removal of any subassembly.

WARNING

Failure to disconnect 27.5-volt power source before removing subassemblies may cause injury to maintenance personnel as well as the destruction of many tubes.

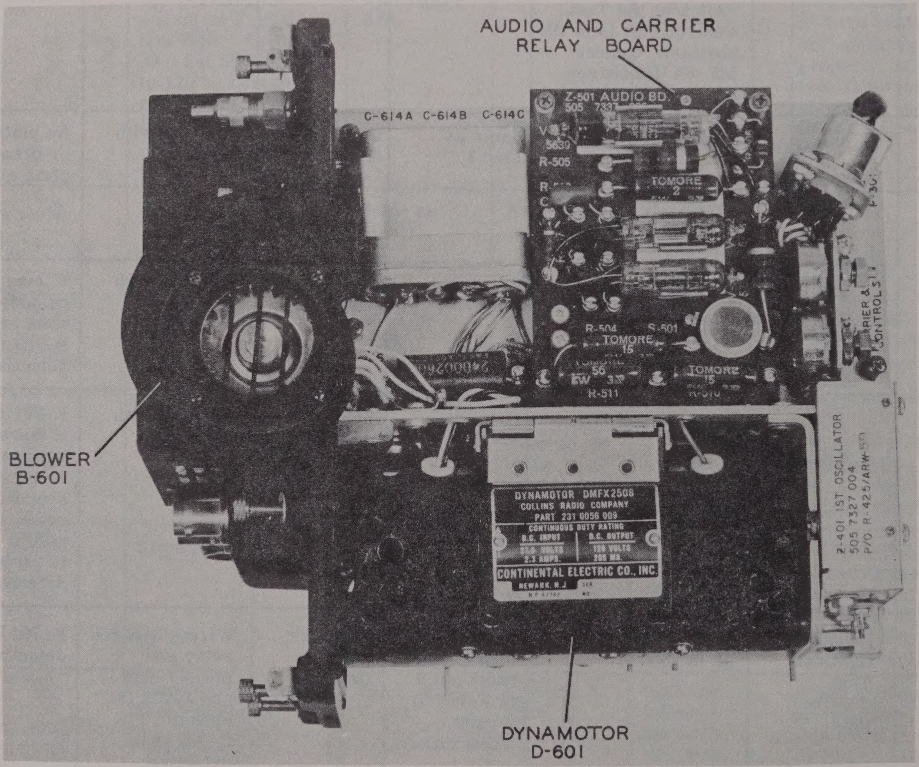


Figure 6-1. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Subassembly Identification

6-42. R-F AMPLIFIER.

a. Remove the shield from the r-f amplifier.

b. Unsolder the coaxial cable from the r-f connector on the r-f amplifier.

c. Unsolder V-403 plate connection to the tripler tank circuit L-108 (at L-108).

d. Unsolder V-102 plate lead feeding the first i-f amplifier at E-123.

e. Loosen the four captive screws holding the r-f amplifier to the main chassis, and the two captive screws that fasten it to the first oscillator chassis.

f. Carefully lift unit out and unsolder power leads near front of unit.

6-43. FIRST OSCILLATOR.

a. Remove shields of first oscillator unit and r-f amplifier unit.

b. Unsolder V-403 plate lead from the tripler tank circuit, L-108 (at L-108).

c. Loosen the two captive screws that fasten the r-f amplifier unit to the first oscillator unit.

d. Loosen the two captive screws that fasten oscillator unit to the main chassis.

e. Carefully lift out unit and unsolder power leads at rear.

6-44. FIRST I-F AMPLIFIER.

a. Remove the shield.

b. Unsolder the r-f connection at E-213.

c. Loosen the four captive screws holding the subassembly to the main panel. The slug rack is fastened to the top of the unit; therefore, the complete assembly can be removed intact.

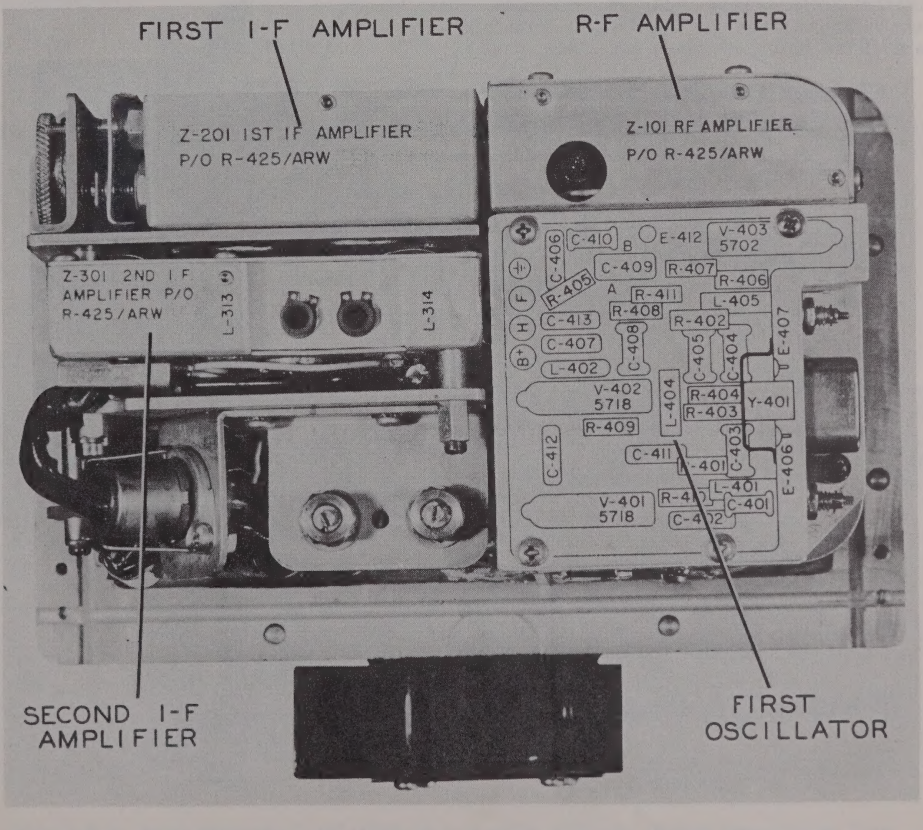

FIRST I-F AMPLIFIER
R-F AMPLIFIER
Z-201 IST IF AMPLIFIER
P/O R-425/ARW
Z-101 RF AMPLIFIER
P/O R-425/ARW
Z-301 2ND I.F.
AMPLIFIER P/O
R-425/ARW
L-313
L-314
C-406
C-410
B
E-412
V-403
5702
C-409
R-407
R-406
R-405
A
R-411
L-405
R-408
R-402
C-413
C-408
C-405
C-404
E-407
C-407
L-402
V-402
5718
L-404
R-404
R-403
Y-401
R-409
C-412
C-411
R-401
C-403
E-406
L-401
V-401
5718
C-401
C-402
SECOND I-F
AMPLIFIER
FIRST
OSCILLATOR

Figure 6-2. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Rear View, Subassembly Identification

d. Carefully slide unit toward right side of receiver to disengage J-201 from J-606A. Lift unit out and unsolder power leads.

6-45. SECOND I-F AMPLIFIER.

a. Loosen the four captive screws accessible near the audio and carrier relay board.

b. Remove P-301.

c. Carefully lift the unit out by pushing directly out from the dynamotor to permit disengagement of J-606B and J-301.

6-46. AUDIO AND CARRIER RELAY BOARD.

a. Loosen the two captive screws at the corners of the board.

b. Insert screwdriver blade in the slot in the bracket which mounts J-502 and J-503. Carefully pry the unit out parallel with the second i-f amplifier, and away from the dynamotor. This will permit the disengagement of plug J-501 from socket J-605.

6-47. DYNAMOTOR.

a. Remove white lead from ground.

b. Unsolder black lead from L-606.

c. Unsolder red lead from C-614C.

d. Remove two screws from dynamotor mounting. Lift dynamotor and mount to raised position.

e. Remove locking wire and two screws fastening dynamotor to mount.

f. Carefully lift dynamotor out.

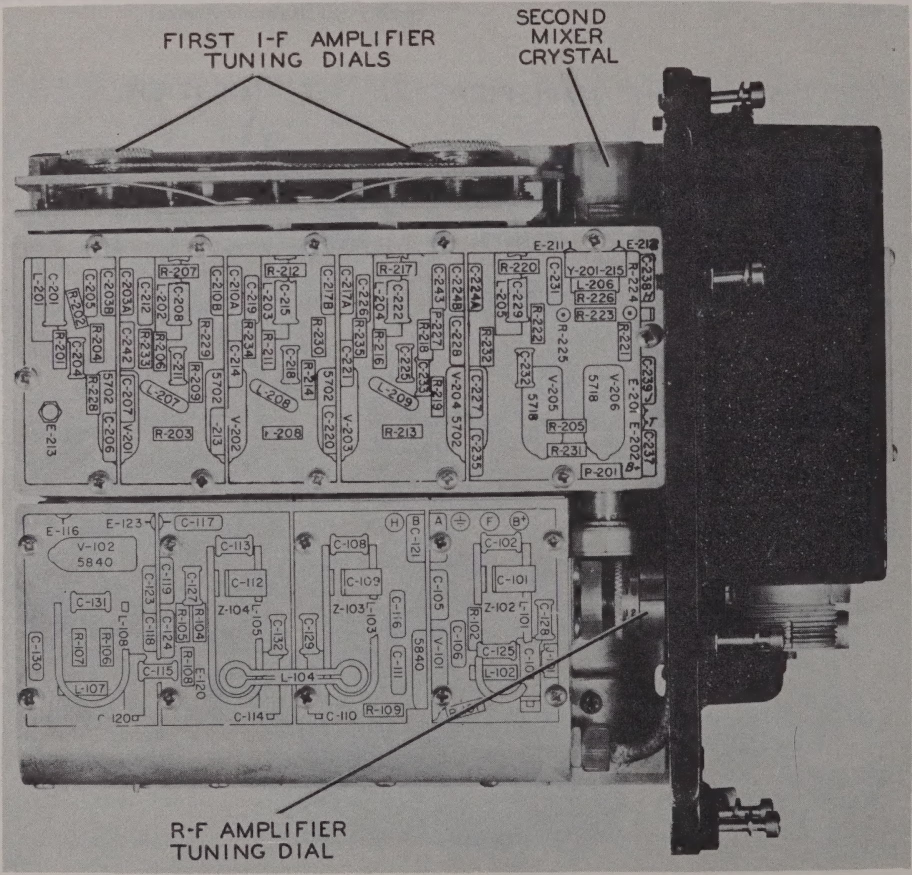

FIRST I-F AMPLIFIER TUNING DIALS
SECOND MIXER CRYSTAL
R-F AMPLIFIER TUNING DIAL
E-211
E-212
L-201
C-201
C-205
R-202
R-201
C-204
R-204
R-228
C-203B
C-203A
C-212
L-202
R-207
C-208
R-233
R-206
C-242
C-211
L-207
R-209
5702
C-207
C-206
V-201
R-203
E-213
C-210B
C-210A
R-229
C-214
5702
213
V-202
R-212
C-219
L-203
C-215
R-234
R-211
C-218
L-208
R-230
R-214
208
C-217B
C-217A
5702
C-220
C-221
V-203
R-217
C-226
L-204
C-222
R-235
R-216
C-225
L-209
R-213
C-243
P-227
R-218
C-233
R-219
C-224B
C-228
V-204 5702
C-224A
R-232
C-227
C-235
R-220
L-205
C-229
C-231
C-232
R-222
5718
V-205
R-225
Y-201-215
L-206
R-226
R-223
R-224
C-238
R-221
5718
V-206
C-239
E-201
E-202
C-237
R-205
R-231
P-201
B+
E-116
E-123
C-117
V-102
5840
C-131
C-130
R-107
R-106
L-108
L-107
C-123
C-118
C-119
C-124
C-127
R-105
R-104
R-108
C-115
E-120
120
C-113
C-112
Z-104
L-105
C-132
C-114
L-104
C-108
C-109
Z-103
L-103
C-129
C-116
C-110
R-109
H
B
C-121
A
F
B+
C-105
C-111
5840
V-101
C-106
C-102
C-101
R-102
Z-102
L-101
C-128
C-125
L-102

Figure 6-3. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Top View, Adjustment and Tuning Controls

6-48. OTHER COMPONENTS. The main chassis may be removed from the front casting by first removing the second i-f amplifier. Five screws hold the panel to the front casting. Ordinary servicing should not require removal of the front casting from the mounting panels.

6-49. AUDIO DECODER KY-55/ARW.

6-50. Audio Decoder KY-55/ARW contains no major subassemblies. Parts of Audio Decoder KY-55/ARW are mounted directly upon two hinged brackets which will not need to be removed in ordinary servicing.

6-51. REPLACEMENT OF SUBASSEMBLIES.

6-52. The procedure for replacing any of the subassemblies is the inverse of the disassembly procedure. The replacement of any subassembly of the receiver should be followed by the adjustment procedure described in paragraph 6-53.

6-53. ADJUSTMENT AND ALIGNMENT.

6-54. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59 SUBASSEMBLY ALIGNMENT AND ADJUSTMENT.

6-55. R-F AMPLIFIER AND FIRST OSCILLATOR. The r-f amplifier and first oscillator must be aligned and tested together. This is necessary because the first oscillator tripler tank is located in the r-f amplifier subassembly. The r-f amplifier and first oscillator subassemblies should be mounted upon a receiver chassis and connected to receive proper filament and plate voltages. Before mounting the r-f amplifier, perform the following adjustments.

a. Set the r-f amplifier tuning dial to position 6. The capacitor plates of C-101, C-109 and C-112 in the r-f amplifier should be 0.062 inch apart in this position. The spacing may be adjusted by loosening the setscrew visible through the hole on the bottom of the unit, and moving the plate as desired. Tighten the setscrew.

b. The spacing between L-103 and L-104, and between L-105 and L-104, should be 0.025 inch. If the spacing is only slightly in error, bend L-104. If the spacing error is quite large, it may be desirable to unsolder and adjust the offending inductance.

6-56. The following procedure requires the use of Signal Generator SG-50/ARW and Voltmeter TS-375/U. Apply power to the r-f amplifier and first oscillator subassemblies. Note whether all the filaments are glowing. Place shield on the r-f amplifier and tighten the screws. The shield on the first oscillator need not be replaced.

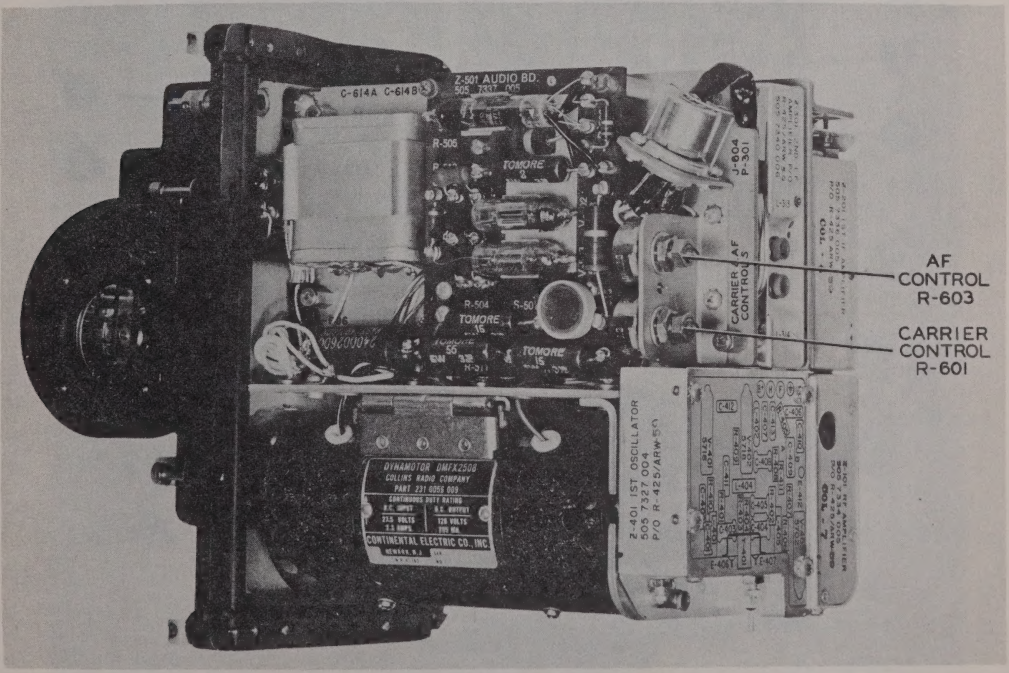


Figure 6-4. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Bottom Rear Oblique View, Adjustment and Tuning Controls

a. Connect Voltmeter TS-375/U between test point ⑰, E-406, and ground. Refer to figure 6-10. Loosen the lock nut on the shaft of L-401 and turn the shaft to obtain a negative peak voltage on Voltmeter TS-375/U. This voltage should be at least -3 volts. Tighten the lock nut.

b. Connect Voltmeter TS-375/U between test point ⑱, E-407, and ground. Loosen the lock nut on L-405 and tune L-405 for a negative peak voltage. This voltage should be -9 volts or greater. Tighten lock nut.

c. Connect Voltmeter TS-375/U between test point ⑪, E-120, and ground. Tune C-120 for a peak negative voltage. A negative peak of at least -0.9 volt should be obtained.

NOTE

There must be no signal input to the r-f amplifier while making the adjustments above.

d. Remove crystal Y-401 from the first oscillator crystal socket XY-401. Connect Signal Generator SG-50/ARW to the r-f input of the r-f amplifier. (If the r-f amplifier is properly connected to J-601, the ANTENNA INPUT connector, the connection may be made to this jack.) Tune the r-f amplifier to 420 megacycles. Tune Signal Generator SG-50/ARW to the 420-megacycle channel and increase the output to obtain a readable indication on Voltmeter TS-375/U. TS-375/U should still be connected to test point ⑪, E-120. Tune C-103, C-110, and C-114, in sequence, for a negative peak voltage at E-120. Refer to figure 6-10.

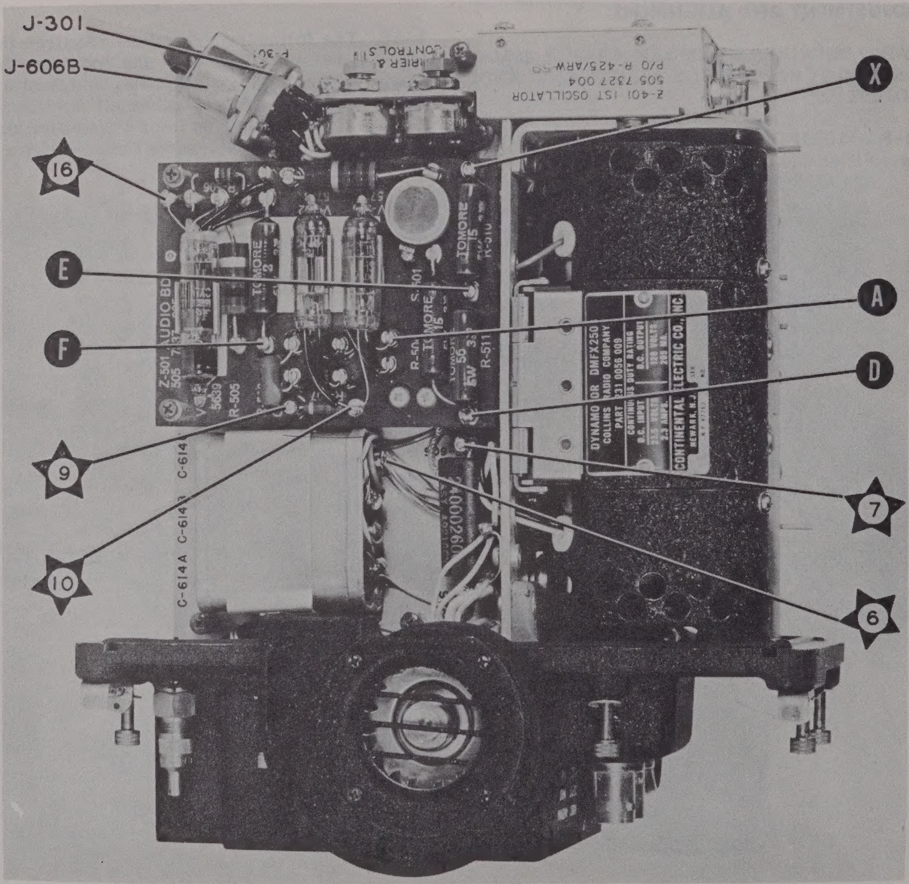


Figure 6-5. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, **Bottom View, Test Points**

e. With the test equipment connected as in step d, measure the gain of the r-f amplifier at 420 megacycles. This can be done by setting Signal Generator SG-50/ARW for 50,000 and 100,000 microvolts output, and noting the voltage change at E-120. The change should be between 0.5 and 1.0 volt (a gain of between 10 and 20).

f. With the test equipment connected as in step d, measure the 6-db bandwidth of the r-f amplifier at 420 megacycles. Apply 50,000 microvolts signal to the r-f amplifier and note the voltage at E-120. Double the signal amplitude (100,000 microvolts) and vary the signal input frequency each side of center to obtain the same voltage at E-120, test point ☆, as before. These two frequencies should be at least 6 megacycles apart and centered about 420 megacycles.

g. Change the frequency of Signal Generator SG-50/ARW to 406 megacycles and tune the r-f amplifier to obtain a peak voltage at the first mixer grid, test point ☆, E-120. Conduct measurements outlined in steps e. and f. at this new frequency. If r-f amplifier does not meet requirements of paragraphs e. and f., it will be necessary to vary the positions of capacitor plates C-101, C-109, and C-112. Loosen setscrews and move plate to cause increase in voltage at E-120.

CAUTION

C-109 is 128 volts above ground potential.

Set each capacitor plate so that movement in either direction will cause a decrease in voltage at E-120. Tighten setscrew. Repeat step d. Tune r-f amplifier to 406 and 420 megacycles and repeat steps e. and f.

h. The r-f amplifier and first oscillator are now in satisfactory working condition. They may be removed

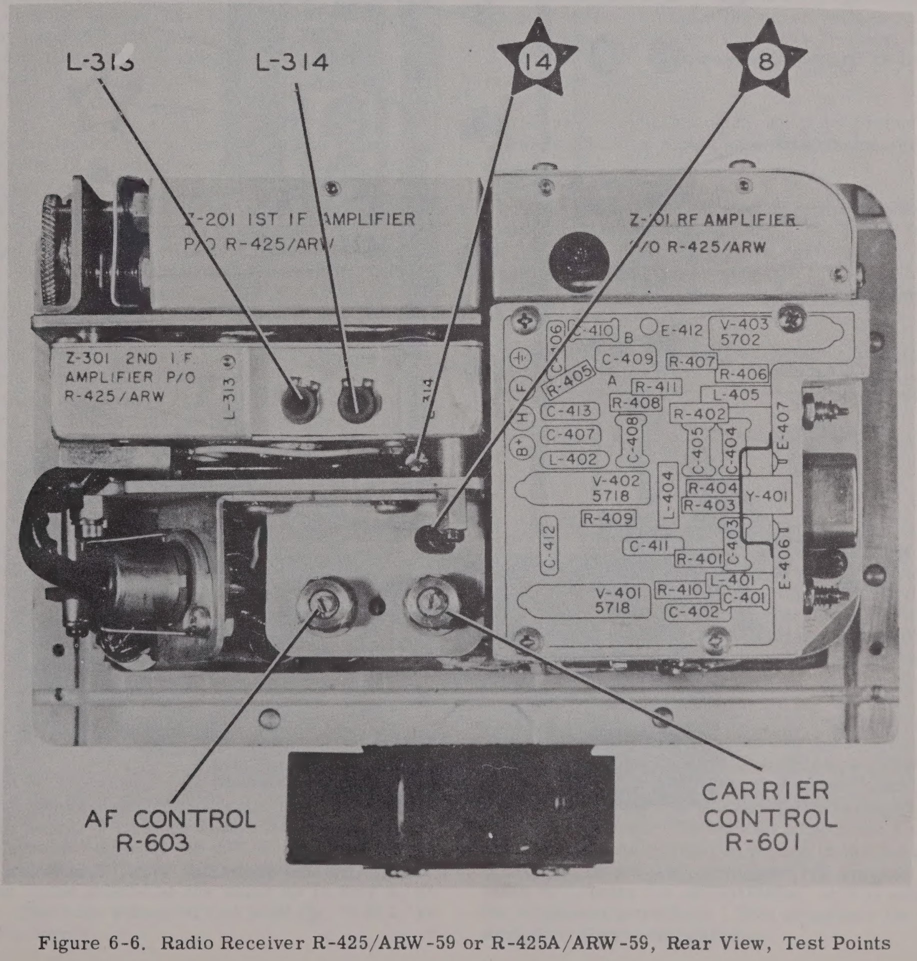

L-313
L-314
14
8
Z-201 1ST IF AMPLIFIER P/O R-425/ARW
Z-101 RF AMPLIFIER P/O R-425/ARW
Z-301 2ND I.F. AMPLIFIER P/O R-425/ARW
AF CONTROL R-603
CARRIER CONTROL R-601

Figure 6-6. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Rear View, Test Points

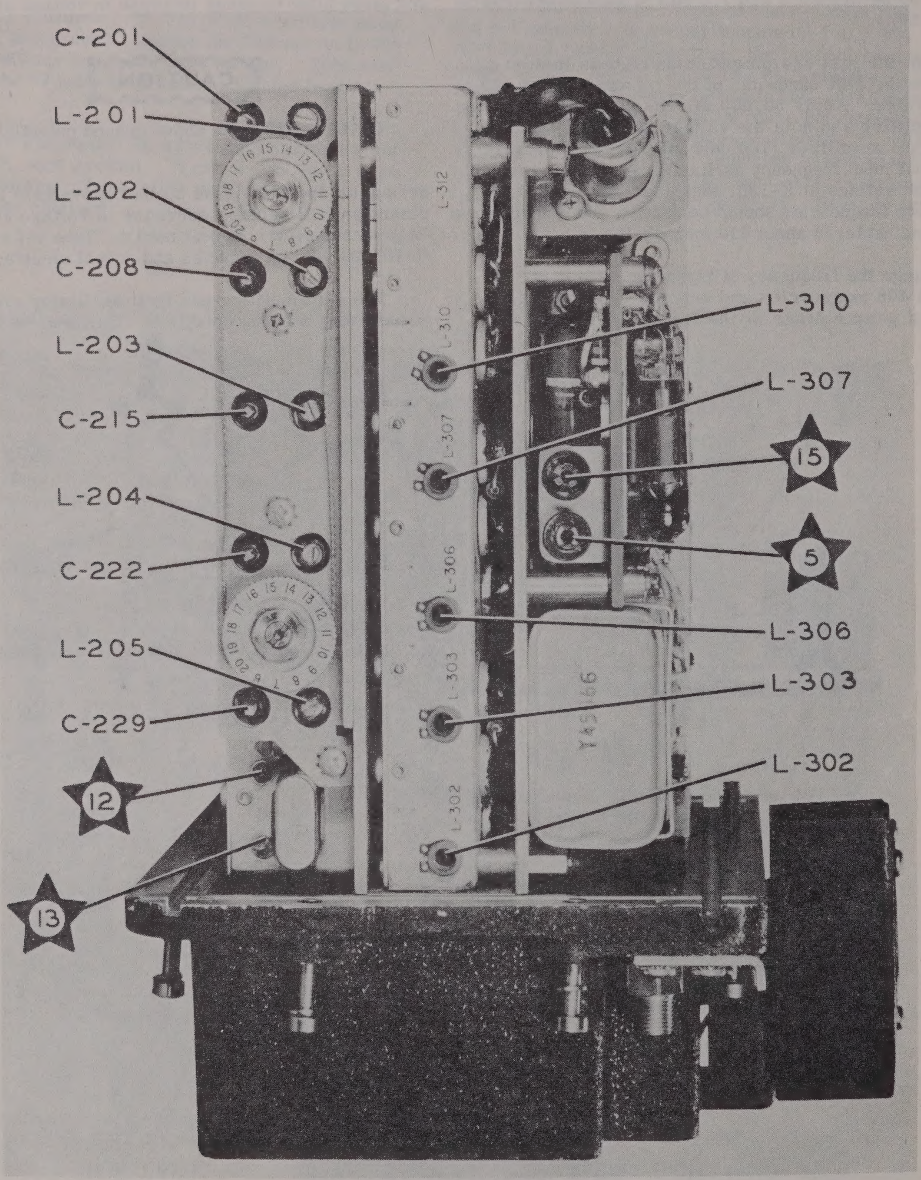

C-201
L-201
L-202
C-208
L-203
C-215
L-204
C-222
L-205
C-229
12
13
L-312
L-310
L-307
L-306
L-303
L-302
15
5
L-310
L-307
L-306
L-303
L-302

Figure 6-7. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Right Side View, Test Points

from the receiver chassis on which they were mounted for testing, and placed in any receiver. However, the r-f amplifier and the first oscillator must both be placed upon the same receiver chassis or the procedure in step c. must be repeated for the new combination of subassemblies.

6-57. FIRST I-F AMPLIFIER. The first i-f amplifier should be mounted in the customary manner upon a receiver chassis. It should be connected to an energized r-f amplifier and second i-f amplifier. The proper filament and plate voltages should be connected. To proceed with the alignment and testing procedure, the following equipment is required:

a. Boonton 202-B or equivalent.

b. Voltmeter TS-375/U.

6-58. Apply power to the first i-f amplifier subassembly. Note whether all the tubes are glowing. Disconnect the wire from terminal T and ground terminal T. Connect Voltmeter TS-375/U between test point ⑧(E-201) and ground. Refer to figure 6-6. Adjust R-601, the CARRIER CONTROL, to obtain 2.0 volts bias. Place the shield on the unit. Disconnect Voltmeter TS-375/U.

a. Turn the first i-f amplifier tuning dial to position 20. Insert the 72.6-megacycle crystal in socket XY-201. Refer to figure 6-3. Connect Boonton Model 202-B to the grid of the first mixer, pin 1 of V-102. Connect Boonton Model 202-B through a length of RG-58/U cable terminated with a 50-ohm resistor. Make the connection to the grid of V-102 through a 5-micromicrofarad capacitor. Connect the shield of the RG-58/U cable to ground. The frequency calibration of the Boonton Model 202-B is not sufficiently precise to allow the instrument to be set directly to the desired frequency. The output should be monitored on a receiver having a calibration accuracy within ±20 kilocycles. As an alternative procedure, the second oscillator and mixer may be tuned up and the output to the second i-f amplifier monitored on a receiver. The receiver must cover the 24.9-megacycle range with a calibration accuracy of ±5 kilocycles. Connect Voltmeter TS-375/U to test point ⑬, E-212, and adjust C-229 for peak negative voltage. The peak voltage should be -2.5 volts or greater. Check the voltage at test point ⑫, E-211. It should be -0.5 volt or greater.

b. Set the frequency of the Boonton Model 202-B to 97.5 megacycles and adjust the output to 100,000 microvolts. Remove crystal from XY-201 and adjust capacitors C-201, C-208, C-215 and C-222 for a peak negative voltage on Voltmeter TS-375/U. Refer to figure 6-7. The peak should be approximately -10 volts.

c. Insert the 72.6-megacycle crystal in XY-201 and adjust the output of Boonton Model 202-B to 2 microvolts. Connect Voltmeter TS-375/U to test point ⑬, E-212, and adjust C-229 for peak negative voltage. The peak value should be the same as in step a. or greater. Check the voltage at test point ⑫, E-211, as directed in step a.

d. Turn first i-f amplifier tuning dial to position 6. Insert the 58.6-megacycle crystal in XY-201. With no signal input from the signal generator, connect Voltmeter TS-375/U to test point ⑬, E-212, and adjust L-205 for maximum negative voltage. Refer to figure 6-7.

e. Remove the crystal from XY-201. Connect Voltmeter TS-375/U to test point ⑫, E-211. Tune the Boonton Model 202-B to 83.5 megacycles and increase the output to get a readable indication on Voltmeter TS-375/U. Tune L-201, L-202, L-203 and L-204 for maximum negative voltage.

f. Repeat steps a. through e. before proceeding further.

g. Turn the first i-f amplifier tuning dial to position 6. Tune the Boonton Model 202-B to 83.5 megacycles. Connect Voltmeter TS-375/U to test point ⑫, E-211. Remove the crystal from XY-201. Increase the signal generator output to obtain a readable indication on Voltmeter TS-375/U. Note the value obtained. Double the input amplitude and tune the signal generator either side of center to obtain the same voltage as before. The difference between these two frequencies is the 6-db bandwidth. The bandwidth should be between 2 and 2.8 megacycles.

h. Repeat step g. using the first i-f tuning dial position of 20 and a signal generator frequency of 97.5 megacycles.

i. Note how closely the center of the bandwidth corresponds to the input frequency. The center frequency of the bandwidth should be no further than 200 kilocycles from the input frequency. Check for bandwidth centering at the following additional input frequencies:

BOONTON MODEL 202-B FREQUENCY	FIRST I-F AMPLIFIER TUNING DIAL POSITION
86.5 mc	9
89.5 mc	12
95.5 mc	18

j. Check the first i-f amplifier gain by noting the change in the r-f signal amplitude required to produce a voltage difference of one-half volt at test point ⑫, E-211. Use any convenient input frequency and observe the output indication on Voltmeter TS-375/U. Remove the crystal from XY-201. Approximately 3500 microvolts should be required to produce a one-half volt difference in output.

k. Connect Voltmeter TS-375/U to test point ⑬, E-212. Install the second oscillator crystals one at a time starting with the 58.6-megacycle crystal. Set the first i-f amplifier tuning at position 6 and increase it one position each time a crystal is replaced; that is, change the first i-f tuning dial to position 7 when the 59.6-megacycle crystal is placed in the socket, etc. The voltage of E-212, test point ⑬, should be -2.5 volts or greater for all channels. If it is not, repeat the alignment procedure. This completes the first i-f amplifier alignment procedure.

6-59. SECOND I-F AMPLIFIER. Mount the second i-f amplifier in the customary manner after setting all the tuning slugs so that approximately 2 threads of each slug are visible on the inside edge of each coil form. The shield must be installed before the unit is mounted. Connect P-301 to J-604. Check to determine whether the following test equipment is available before proceeding further:

a. Boonton Model 202-B.

b. "Univerter" Boonton Model 203-B.

c. Voltmeter TS-375/U.

d. Electronic Multimeter ME-6A/U.

6-60. Connect the output of the Boonton Model 202-B to the Boonton Model 203-B. The output of the Boonton Model 203-B should be connected to the grid of the second mixer, pin 7 of V-204. Use a piece of RG-58/U cable terminated with a 50-ohm resistor for this connection. Connect the cable to the grid of V-204 through a 5-micromicrofarad capacitor. Ground the shield of the RG-58/U cable. Set the Boonton Model 202-B for an output frequency of 94.9 megacycles. The calibration of the Boonton Model 202-B is not sufficiently precise to allow the instrument to be set to the desired frequency without checking. Monitor the output on a receiver having a calibration accuracy of ±5 kilocycles. Adjust the Boonton Model 202-B until the output of the Boonton Model 203-B is exactly 24.9 megacycles. The frequency of the output must be checked each time the tuning is changed.

a. Connect Voltmeter TS-375/U to test point ☆5, J-503. Refer to figure 6-7. Increase the output of the Boonton Model 203-B and Boonton Model 202-B and note whether

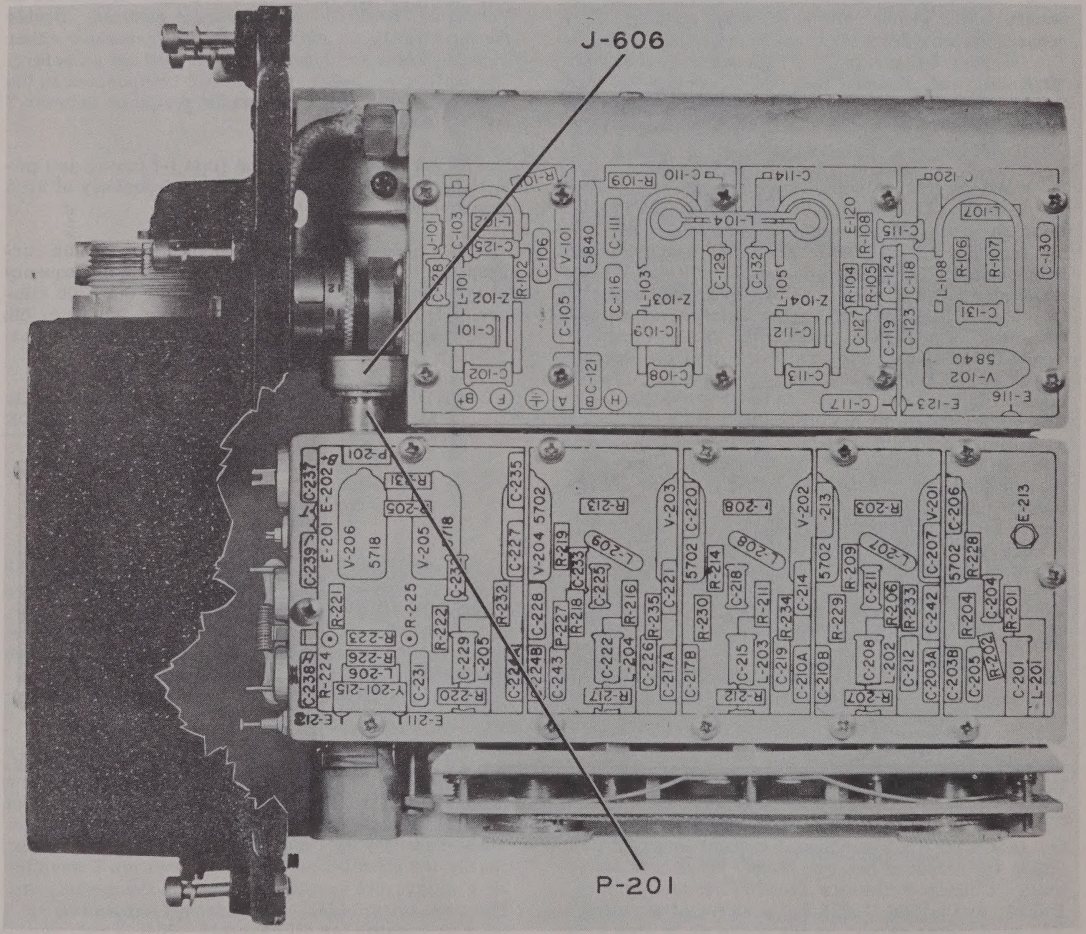


Figure 6-8. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Top View, Front Panel Cutaway

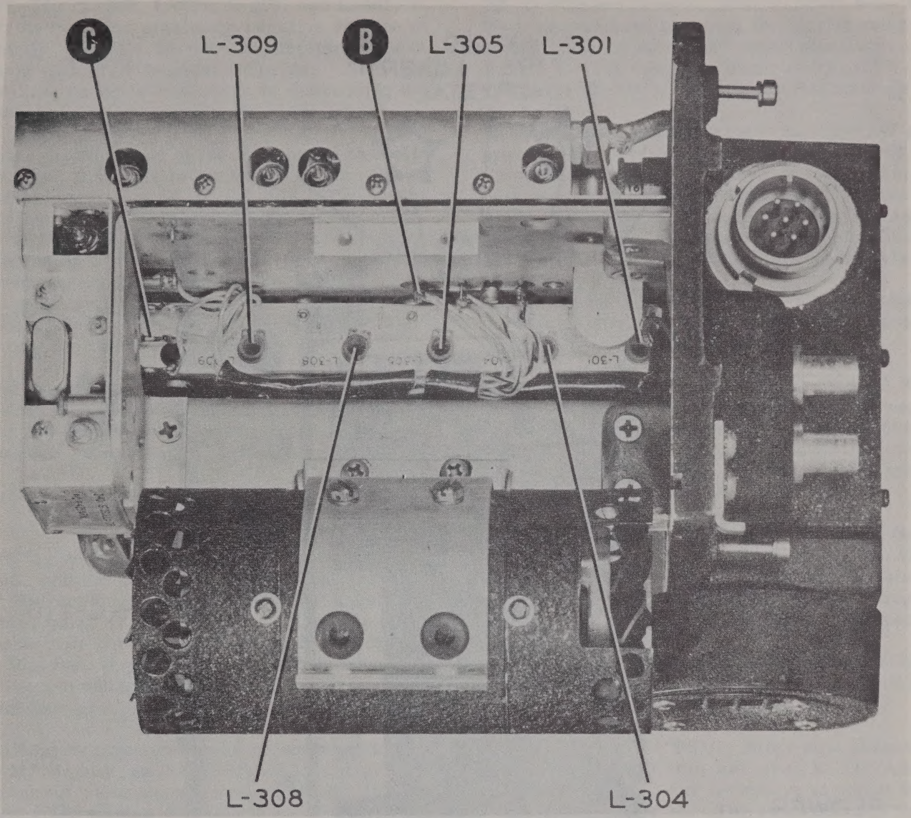


Figure 6-9. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Left Side With Dynamotor in Raised Position, Test Points

the voltage at test point ★5, J-503, becomes increasingly negative.

b. Adjust all inductances, L-301 through L-310, for a negative peak voltage at test point ★5, J-503. Inductances L-301, L-304, L-305, L-308, and L-309 may be reached by raising the dynamotor to its detented "up" position. Refer to figure 6-9. It will be necessary to progressively reduce the signal generator input as the inductances are adjusted to keep the indication on the 3-volt scale of Voltmeter TS-375/U.

c. Check the second i-f amplifier gain by determining the amount of signal input amplitude necessary to cause a 0.5-volt increase in voltage at test point ★5, J-503. Approximately 100 microvolts should be required.

•d. Connect Voltmeter TS-375/U between test point ★14, E-319 and ground. Refer to figure 6-6. Connect Electronic Multimeter ME-6A/U in parallel with Voltmeter TS-375/U. Set the r-f input to 30,000 microvolts and turn on frequency modulation of 1000 cycles at 120 kilocycles deviation. Tune L-314 to obtain zero d-c voltage on Voltmeter TS-375/U. Tune L-313 to obtain a maximum a-c voltage on Electronic Multimeter ME-6A/U.

e. Repeat step d. until a maximum a-c voltage is obtained, coincident with zero d-c voltage.

f. Connect Voltmeter TS-375/U between test point ★5, J-503, and ground. Set the instrument to the three-volt scale.

g. Adjust inductances L-301, L-303, L-305, L-307, and L-309 counterclockwise for a minimum negative voltage at test point ★5, J-503. Refer to figures 6-7 and 6-9. Increase the signal generator output level to keep the indication on Voltmeter TS-375/U easily readable as the alignment progresses.

h. Tune L-310, L-308, L-306, L-304, and L-302, in the order named, for maximum negative voltage on Voltmeter TS-375/U. Adjust the signal generator output amplitude to keep the indication on the three-volt scale.

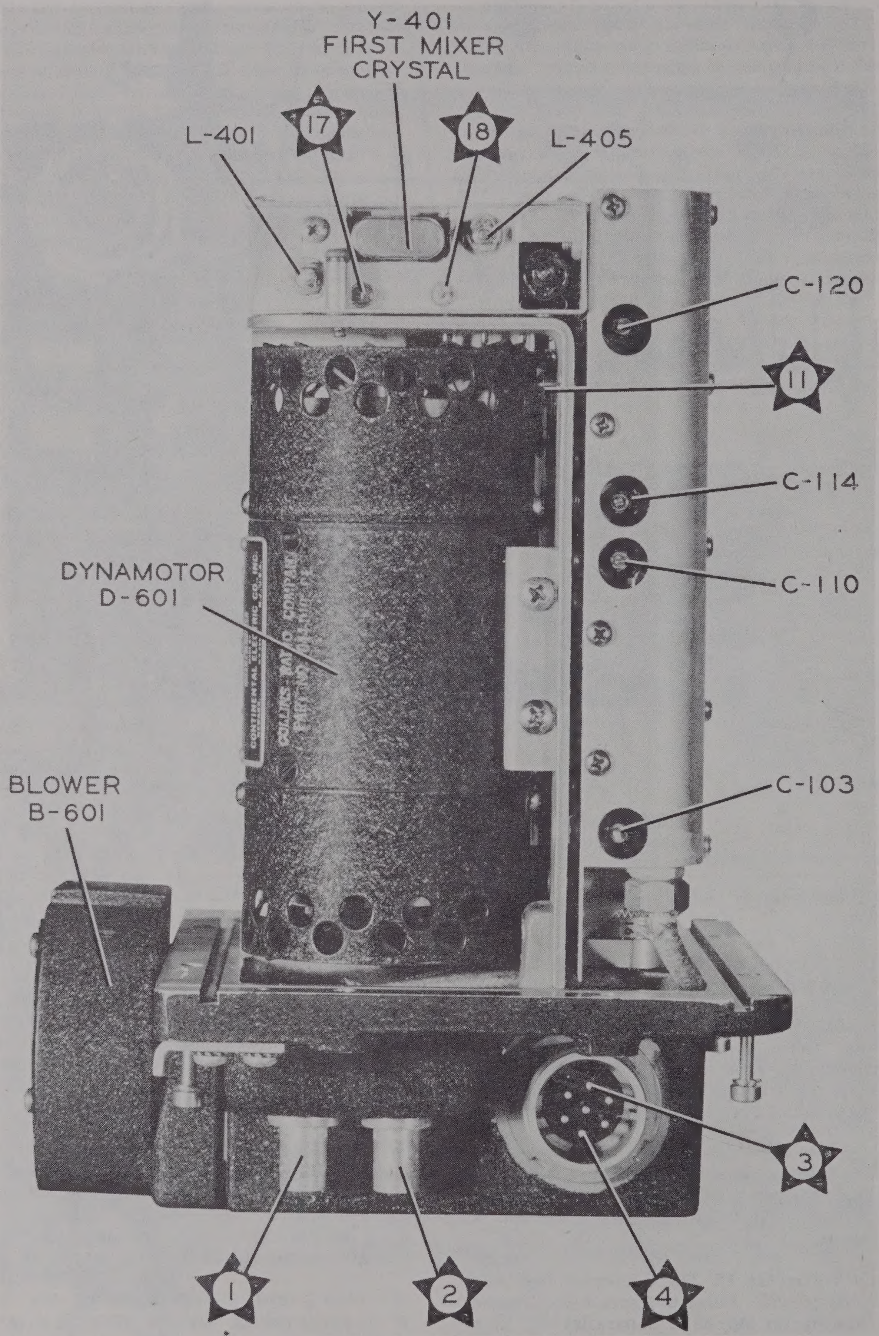

Y-401
FIRST MIXER
CRYSTAL
L-401
17
18
L-405
C-120
11
C-114
C-110
DYNAMOTOR
D-601
BLOWER
B-601
C-103
3
1
2
4

Figure 6-10. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Left Side View, Test Points

i. Tune L-309, L-307, L-305, L-303, and L-301, in the order named, for maximum negative voltage at test point 5, J-503. Be sure to keep the slugs in engagement with their tensioning springs. Keep the voltage within the three-volt range by decreasing the input signal.

j. Increase the amplitude of the input signal to obtain a bias voltage 0.5 volt more negative than the no signal value at test point 5, J-503. The signal generator frequency should be exactly 24.900 megacycles. Double the signal input level and tune the signal generator each side of the 24.900-megacycle center frequency until the bias drops down to 0.5 volt. The frequencies so obtained should be between 605 and 735 kilocycles apart and centered (within 25 kilocycles) about the center frequency.

k. If the band pass just determined is slightly off center, it may be possible to touch it up by carefully repeaking the odd numbered inductances. If this is not successful, repeat steps f. through i.

l. Retune the discriminator by repeating steps d. and e.

m. Turn the deviation of the signal generator to 20 kilocycles, and the amplitude to 30,000 microvolts. Connect Electronic Multimeter ME-6A/U between E-319 (test point 14) and ground. Slowly tune the signal generator between 24.525 and 25.275 megacycles. Plot the a-c voltage output for this frequency range. The a-c voltage output should be linear within ±5 percent throughout the entire frequency range.

n. The linearity may sometimes be improved by detuning L-313 slightly, and readjusting L-314 to provide zero d-c output. See steps d. and e. Replot the a-c output according to step m.

o. Adjust the signal generator amplitude to 30,000 microvolts and the deviation to 120 kilocycles. With Electronic Multimeter ME-6A/U connected between E-319 (test point 14) and ground, approximately 1.7 volts rms output should be obtained.

p. Repeat step c.

6-61. AUDIO AND CARRIER RELAY BOARD. Mount the audio and carrier relay board in a receiver in the conventional manner. Apply plate and filament voltages. Note whether the tube filaments are glowing. The following test equipment is necessary to test and adjust the audio and carrier relay board:

a. Signal Generator SG-50/ARW.

b. Voltmeter TS-375/U.

c. Electronic Multimeter ME-6A/U.

d. Test Control Unit or other means of checking carrier relay closure.

6-62. Connect Signal Generator SG-50/ARW to the ANT connector (J-601, test point 1). Refer to figure 6-10. Connect Voltmeter TS-375/U between test point 5, (J-503) and ground. Refer to figure 6-7. Increase the r-f signal amplitude until the carrier relay, K-601, closes. The carrier relay should close with a reading of -1.8 to -3.4 volts on Voltmeter TS-375/U. Leave Voltmeter TS-375/U connected to test point 5, J-503.

a. Increase Signal Generator SG-50/ARW output to provide -3.5 V dc or more at test point 5, J-503. Connect the Dummy AF Load or a 560-ohm, 2-watt resistor between J-602 and ground. If the Dummy AF Load is used, make connection using the Audio Test Cable Assembly. Modulate Signal Generator SG-50/ARW with 1000 cycles at 120 kilocycles deviation.

b. Adjust the AF CONTROL, R-601, to obtain a 1.1-volt rms signal at test point 15 (J-502) as measured on Electronic Multimeter ME-6A/U.

c. Connect Electronic Multimeter ME-6A/U across the dummy load. This may be done by connecting the Audio Test Cable Assembly between J-602 and the audio load, then connecting the voltmeter to the third connector of this cable. An audio voltage of approximately 0.9-volt rms should be obtained.

d. Decrease the output level of Signal Generator SG-50/ARW. When the voltage reading on Voltmeter TS-375/U becomes approximately -2.0 volts or less, the voltage across the dummy load should drop to zero. This indicates that the carrier relay has opened.

6-63. ADJUSTMENT OF RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59 AFTER INSTALLATION OF SUBASSEMBLIES.

6-64. INTRODUCTION. After new subassemblies are installed in Radio Receiver R-425/ARW-59 or R-425A/ARW-59, it is necessary to adjust the overall receiver circuits. The adjustment procedure is described below.

6-65. TEST EQUIPMENT. The following test equipment must be available to complete this procedure:

a. Signal Generator SG-50/ARW.

b. Electronic Multimeter ME-6A/U.

c. Voltmeter TS-375/U.

6-66. PROCEDURE. Connect Radio Receiver R-425/ARW-59 as shown in figure 5-2. Audio Decoder KY-55/ARW is used only as a load for the audio circuits of Radio Receiver R-425/ARW-59. If desired, Audio Decoder KY-55/ARW may be replaced by the Dummy AF Load or a 560-ohm, 2-watt resistor. Allow the receiver to warm up for 5 minutes before conducting the adjustment procedure below. All shields should be in place.

a. Using Signal Generator SG-50/ARW as a signal source, provide a 420-megacycle signal of several thousand microvolts amplitude to the ANTENNA INPUT connector, J-601 (test point 1). Tune the r-f amplifier subassembly to 420 megacycles. Remove the first oscillator crystal, Y-401, from its socket. Connect Voltmeter TS-375/U to test point 11, E-120.

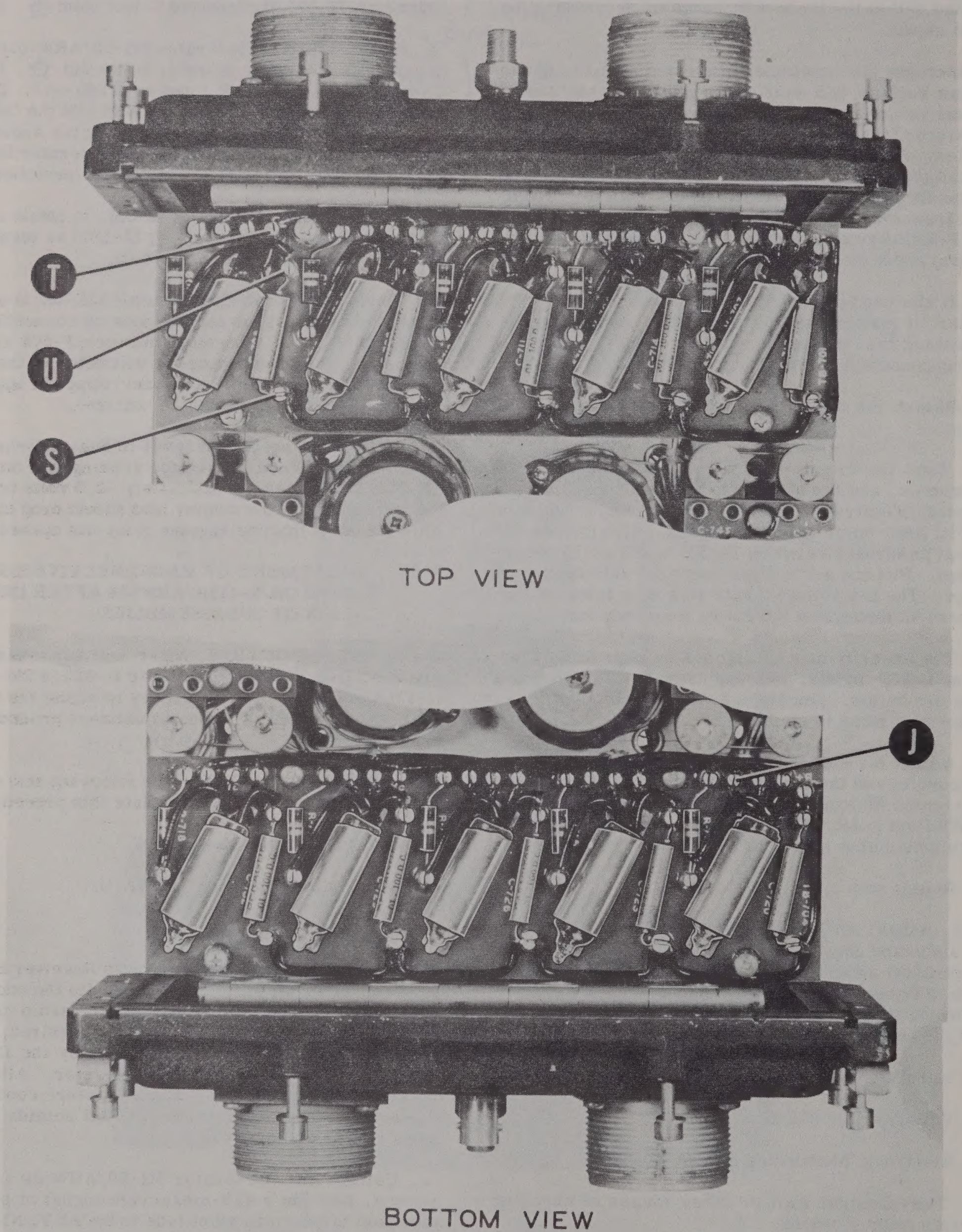

T
U
S
TOP VIEW
J
BOTTOM VIEW

Figure 6-11. Audio Decoder KY-55/ARW, Top and Bottom View, Test Points

Refer to figure 6-10. Peak the input tank, Z-102, by adjusting C-103 for a peak negative voltage at E-120, test point 11. Disconnect Signal Generator SG-50/ARW.

b. Replace the first oscillator crystal, Y-401, in its socket. Connect Voltmeter TS-375/U to E-407, test point 18, on the first oscillator subassembly. If the first oscillator is operating satisfactorily, a reading of -9 volts or greater should be obtained.

c. With crystal Y-401 in its socket, connect Voltmeter TS-375/U to E-120, test point 11. Turn C-120 to obtain the maximum negative reading on Voltmeter TS-375/U. This process peaks the first oscillator tripler tank (L-108, C-131, and C-120).

d. Peak the first i-f amplifier input tank (L-201, C-201) by the following procedure: Using Signal Generator SG-50/ARW as a signal source, apply a 420-megacycle signal of several thousand microvolts amplitude to the ANTENNA INPUT connector, J-601 (test point 1). Tune the r-f amplifier to 420 megacycles. Remove the crystal from the second oscillator crystal socket, XY-201, but be sure that the first oscillator crystal, Y-401, is properly in place in its socket. Connect Voltmeter TS-375/U to E-211 (test point 12). Refer to figure 6-7. Tune C-201 to obtain a peak negative voltage at E-211.

e. Turn the output of Signal Generator SG-50/ARW to zero. Place crystal Y-215 in the second oscillator crystal socket, XY-201. Connect Voltmeter TS-375/U to E-211, test point 12. Note the voltage indication. Connect Voltmeter TS-375/U to E-212, test point 13, and note the voltage reading obtained. If the second oscillator is functioning properly, negative voltages of -0. 5 or greater and -2. 5 or greater will be obtained at E-211 and E-212, respectively.

f. Peak the input tank of the second i-f amplifier by the procedure below: Remove the two screws holding the dynamotor mounting bracket and rotate the bracket to its "up" position. Tune the equipment to any channel. Apply an r-f signal input of the proper channel frequency using Signal Generator SG-50/ARW as a signal source. The signal should be coupled to the ANTENNA INPUT connector, J-601 (test point 1). Connect Voltmeter TS-375/U to J-503, test point 5. Tune coil L-301 (accessible under the dynamotor mounting bracket) to secure a negative peak voltage on Voltmeter TS-375/U.

g. Tune the receiver to the 406-megacycle channel. Apply a 3-microvolt, 406-megacycle signal to the ANTENNA INPUT connector J-601 (test point 1). Set the CARRIER CONTROL, R-601, to provide carrier relay (K-601) closure at exactly 3 microvolts input. Set Signal Generator SG-50/ARW for an output frequency of 400. 25 megacycles, and increase the amplitude until the carrier relay just closes. If the carrier relay closes before 9, 500 microvolts is reached, it will be necessary to adjust the trap circuit in the first oscillator (L-405, C-404 and C-405). To do so, connect Voltmeter TS-375/U to J-503, test point 5. Refer to figures 6-7 and 6-10. Adjust L-405 for a minimum negative voltage. Determine the input amplitude which corresponds to carrier relay closure as described above. It should be 9, 500 microvolts or more. Connect Voltmeter TS-375/U to E-407, test point 18, and check the first oscillator level. It should have maintained a level of -9 volts or greater. The procedure above provides adjustment of the spurious frequency response to a level at least 70 db below the response at 406 megacycles.

h. Set the receiver to the desired channel frequency. Connect Signal Generator SG-50/ARW to J-601, test point 1 (ANTENNA INPUT). Tune Signal Generator SG-50/ARW to the receiver frequency channel and set the output level to 3 microvolts. Adjust CARRIER CONTROL, R-601, to obtain carrier relay (K-601) closure at this value of input signal. Connect Voltmeter TS-375/U to test point 8, E-201, and note the voltage obtained. Approximately +3 volts should be present at this point. Rotate the CARRIER CONTROL, R-601, to the maximum clockwise and counterclockwise positions. Increase output of Signal Generator SG-50/ARW from zero to obtain carrier relay closure in each position of R-601. Less than 5 microvolts should be required in the clockwise position, and more than 100 microvolts should be required in the counterclockwise position.

i. With Signal Generator SG-50/ARW tuned as in step h, modulate the signal output with a 1000-cps tone at a deviation of 120 kilocycles. Increase output of Signal Generator SG-50/ARW to 200 microvolts. Connect Electronic Multimeter ME-6A/U to the AUDIO OUTPUT connector, J-502 (test point 2). Electronic Multimeter ME-6A/U must be shunted by a 560-ohm load. Audio Decoder KY-55/ARW or the Dummy AF Load may be connected to provide this load. A 560-ohm, 2-watt resistor may also be used. An a-f output of at least 0. 88 volt rms should be obtained when R-603, the AF CONTROL, is in the full clockwise position.

j. Check the signal-to-noise ratio of the receiver with 5 microvolts input as described below: Set Signal Generator SG-50/ARW to provide 5 microvolts output at the receiver channel frequency. Modulate the output 1000 cps at 120 kilocycles deviation. Connect a Ballantine 300 Voltmeter to the AUDIO OUTPUT connector J-602, test point 2. If a Ballantine 300 Voltmeter cannot be obtained, Electronic Multimeter ME-6A/U may be used, with somewhat less desirable results. Note the reading. Turn off the modulation at Signal Generator SG-50/ARW. Note the reading again. The ratio of the first reading to the second reading should be 2 to 1; that is, the signal-to-noise ratio should be at least 6 db (2 to 1) if the Ballantine 300 Voltmeter is used. With Electronic Multimeter ME-6A/U, a ratio of at least 4 db (1. 6 to 1) should be obtained.

6-67. MINIMUM PERFORMANCE STANDARDS FOR RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59.

6-68. GENERAL. The complete receiver should equal or exceed the performance standards in the table below. These standards are part of the adjustment procedure in paragraphs 6-63 through 6-66. Consequently, any receiver that has been successfully adjusted in accordance with these paragraphs will meet the standards.

TABLE XXII. RADIO RECEIVER R-425/ARW-59 OR R-425A/ARW-59 PERFORMANCE STANDARDS

FUNCTION	PARAGRAPH REFERENCE	TEST POINT	SATISFACTORY PERFORMANCE
First Oscillator Voltage	6-66 b.	E-407 test point ★18	-9 volts or more
Second Oscillator Voltage	6-66 e.	E-211 test point ★12	-0. 5 volt or more
		E-212 test point ★13	-2. 5 volts or more
Cathode Bias of First I-F Amplifier	6-66 h.	Pin 7, first i-f amplifier test point ★8	Approx. +3 volts
Audio Output	6-66 i.	AUDIO OUTPUT, J-602, test point ★2	Not less than 0. 88 volt rms
Carrier Relay Closure	6-66 h.	J-603-B test point ★3	Adjustable between 5 and 100 microvolts
		J-603-E test point ★4	
Signal-to-noise ratio	6-66 j.	AUDIO OUTPUT, J-602, test point ★2	6 db
Rejection of Spurious Frequency (400. 25 mc)	6-66 g.		70 db

6-69. AUDIO DECODER KY-55/ARW ALIGNMENT.

6-70. INTRODUCTION. Each of the ten audio filters in Audio Decoder KY-55/ARW must be adjusted to resonance at the proper audio frequency. Since the alignment of each channel is a laborious cut-and-try process, it is recommended that alignment procedures should not be undertaken until it is certain that misalignment is the cause of the trouble. Paragraph 5-19 describes a method for checking the resonant frequencies of the ten filter circuits. Check and recheck the frequency until certain that the filter is detuned or defective. If any filter components are replaced, the filter must be realigned according to paragraph 6-71. The manufacturing tolerance of ±1 percent on filter capacitors and inductors is too large to permit direct replacement of components without checking the resultant frequency.

NOTE

Temperature compensating capacitors must be replaced with capacitors having the same temperature coefficient and capacitance.

6-71. AUDIO FILTER ALIGNMENT. Connect equipment as shown in figure 5-3. Operate POWER switch on the Test Control Unit to ON and allow the equipment 5 minutes to warm up. Tune Signal Generator TS-382A/U exactly to the design frequency of the channel under test. Refer to table XII for the proper channel frequencies. Check frequency using Meter R16AN-USM26HWP. Set Signal Generator TS-382A/U at the exact frequency value. The procedure described below is for the 7. 500-kilocycle channel (channel 1), but with the exception of audio frequency values and symbol designations, it applies equally to any of the other channels. Refer to figure 7-4 or 7-5 to correlate symbol numbers of the various channels.

NOTE

The trimmer capacitors are marked on the edge with a blue line to indicate original factory setting. If the wrong trimmer is adjusted during alignment, it may be returned to its original position by use of the blue line marking.

a. Adjust AF CONTROL (R-603) on Radio Receiver R-425/ARW-59 or R-425A/ARW-59 to secure an indication of 0. 60 volt on Electronic Multimeter ME-6A/U.

b. Disconnect Electronic Multimeter ME-6A/U from the audio output and connect it between the ends of L-702B.

c. Temporarily connect a one-half watt composition resistor of approximately 20,000 to 30,000 ohms resistance directly across L-702A. JAN type RC20BF223K resistor is satisfactory.

d. Vary the capacitance at C-703 by selecting fixed capacitors listed in the Parts Breakdown for Radio Receiving Set AN/ARW-59, if the range of C-738 is not sufficient.

NOTE

The slot in trimmer C-738 should not be within approximately 15° of being parallel to the edge

> of the terminal board it is mounted upon. Useful trimmer range is approximately 75° each side of position with slot perpendicular to edge of terminal board.

In selecting fixed capacitors, be certain that temperature compensating capacitors are replaced by capacitors of the same value and coefficient of capacitance (if replacement is necessary due to defect).

e. Tune Signal Generator TS-382A/U to obtain a peak reading on Electronic Multimeter ME-6A/U. Measure the frequency using Meter R16AN-USM26HWP. The frequency obtained is the resonant frequency of the series resonant filter. Vary C-738 over useful tuning range (see note, above) to find whether the resonant frequency of the filter can be reached by this combination of capacitors.

f. Change the combination of capacitors at C-703 until a combination is found that will tune the filter to 7.500 kilocycles (within the range of C-378).

g. Remove the 20,000 to 30,000 ohm resistor from its present location and connect it temporarily across the series combination of L-701 and L-702B.

h. Repeat steps d., e. and f. for capacitor C-704 and C-739.

i. Remove the resistor from across L-701 and L-702B. The filter is now properly tuned to 7.500 kilocycles.

6-72. AUDIO DECODER KY-55/ARW MINIMUM PERFORMANCE STANDARDS.

6-73. Audio Decoder KY-55/ARW should meet or exceed the following electrical requirements. If it does not, the faulty circuits must be retuned in accordance with paragraph 6-71. Refer to paragraph 5-19 for the recommended method of checking the resonant frequency of each audio filter.

TABLE XXIII. AUDIO DECODER KY-55/ARW PERFORMANCE STANDARDS

FUNCTION	SATISFACTORY PERFORMANCE
Audio Filters	Within limits stated in table XII.

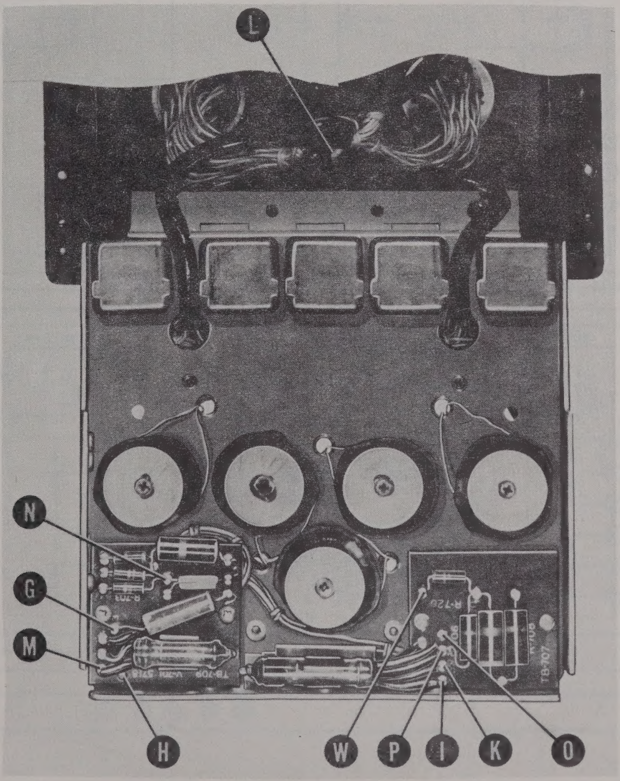
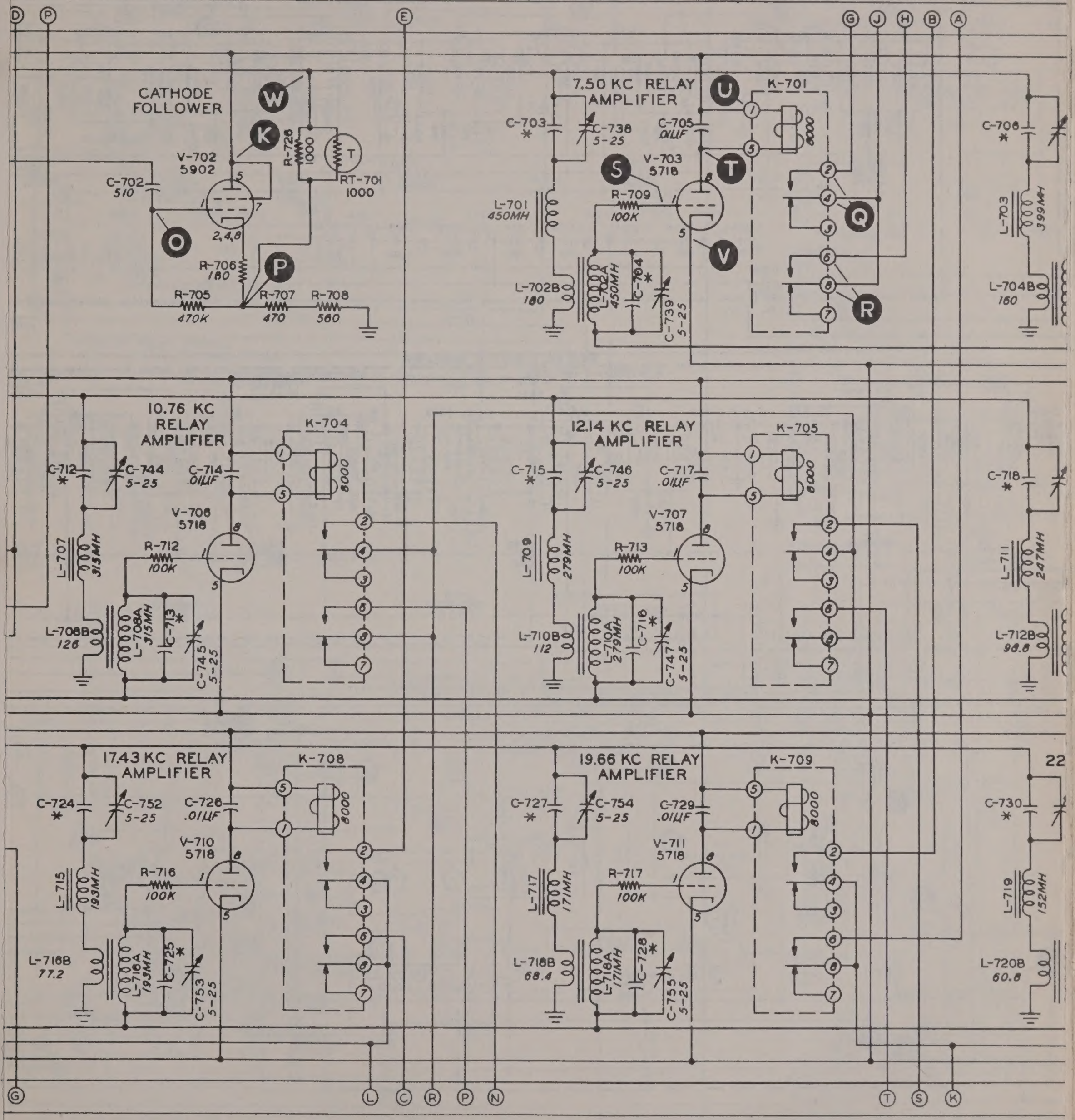
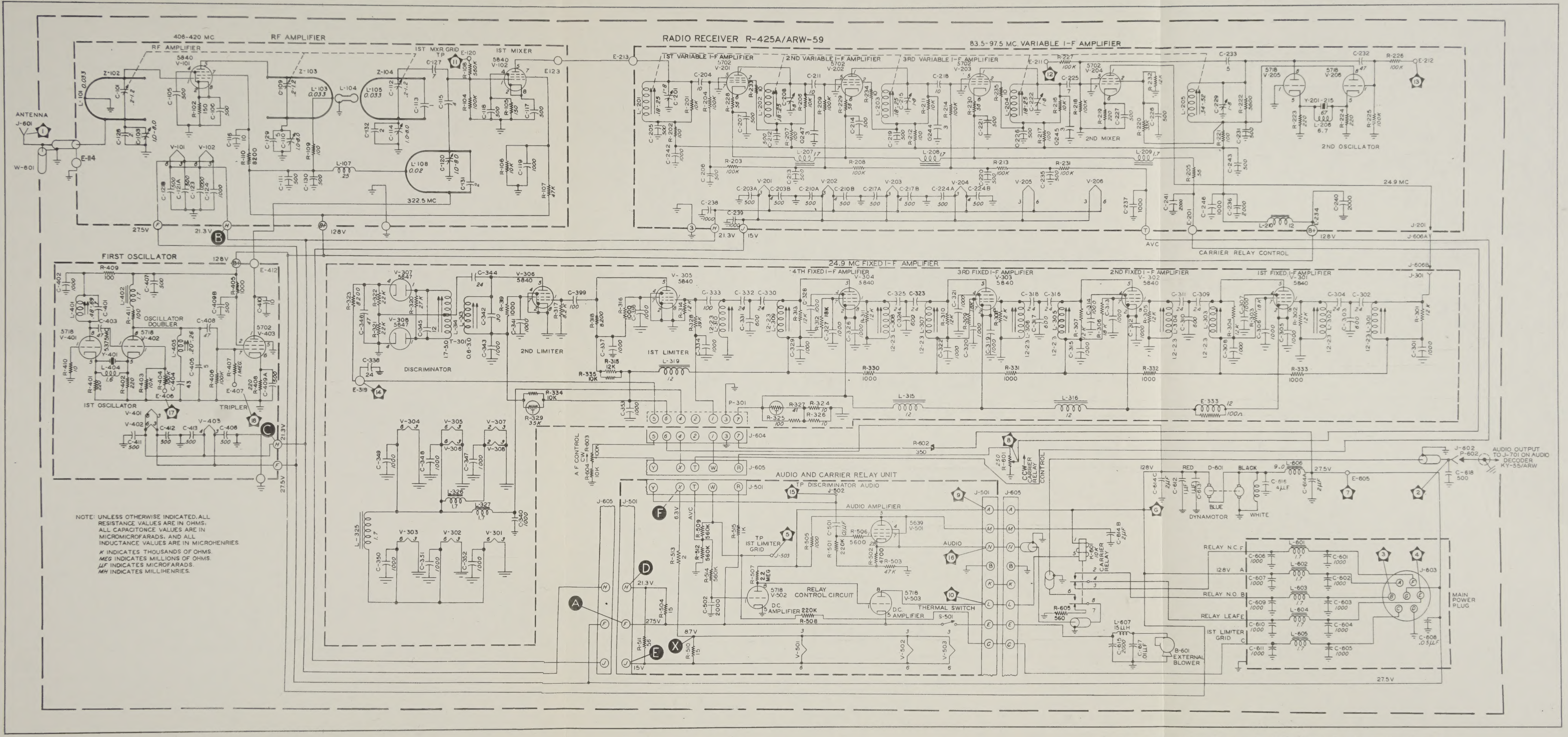


Figure 6-12. Audio Decoder KY-55/ARW, Inside View, Test Points


D
P
E
G
J
H
B
A
CATHODE FOLLOWER
W
K
V-702
5902
C-702
510
R-728
1000
T
RT-701
1000
O
2,4,8
R-706
180
P
R-705
470K
R-707
470
R-708
560
7.50 KC RELAY AMPLIFIER
U
K-701
C-703
C-738
5-25
C-705
.01UF
8000
S
V-703
5718
T
L-701
450MH
R-709
100K
Q
V
L-702B
180
L-702A
450MH
C-704
C-739
5-25
R
C-706
L-703
399MH
L-704B
160
10.76 KC RELAY AMPLIFIER
K-704
C-712
C-744
5-25
C-714
.01UF
8000
V-706
5718
L-707
313MH
R-712
100K
L-708B
126
L-708A
313MH
C-713
C-745
5-25
12.14 KC RELAY AMPLIFIER
K-705
C-715
C-746
5-25
C-717
.01UF
8000
V-707
5718
L-709
279MH
R-713
100K
L-710B
112
L-710A
279MH
C-716
C-747
5-25
C-718
L-711
247MH
L-712B
98.8
17.43 KC RELAY AMPLIFIER
K-708
C-724
C-752
5-25
C-726
.01UF
8000
V-710
5718
L-715
193MH
R-716
100K
L-716B
77.2
L-716A
193MH
C-725
C-753
5-25
19.66 KC RELAY AMPLIFIER
K-709
C-727
C-754
5-25
C-729
.01UF
8000
V-711
5718
L-717
171MH
R-717
100K
L-718B
68.4
L-718A
171MH
C-728
C-755
5-25
22
C-730
L-719
152MH
L-720B
60.8
G
L
C
R
P
N
T
S
K

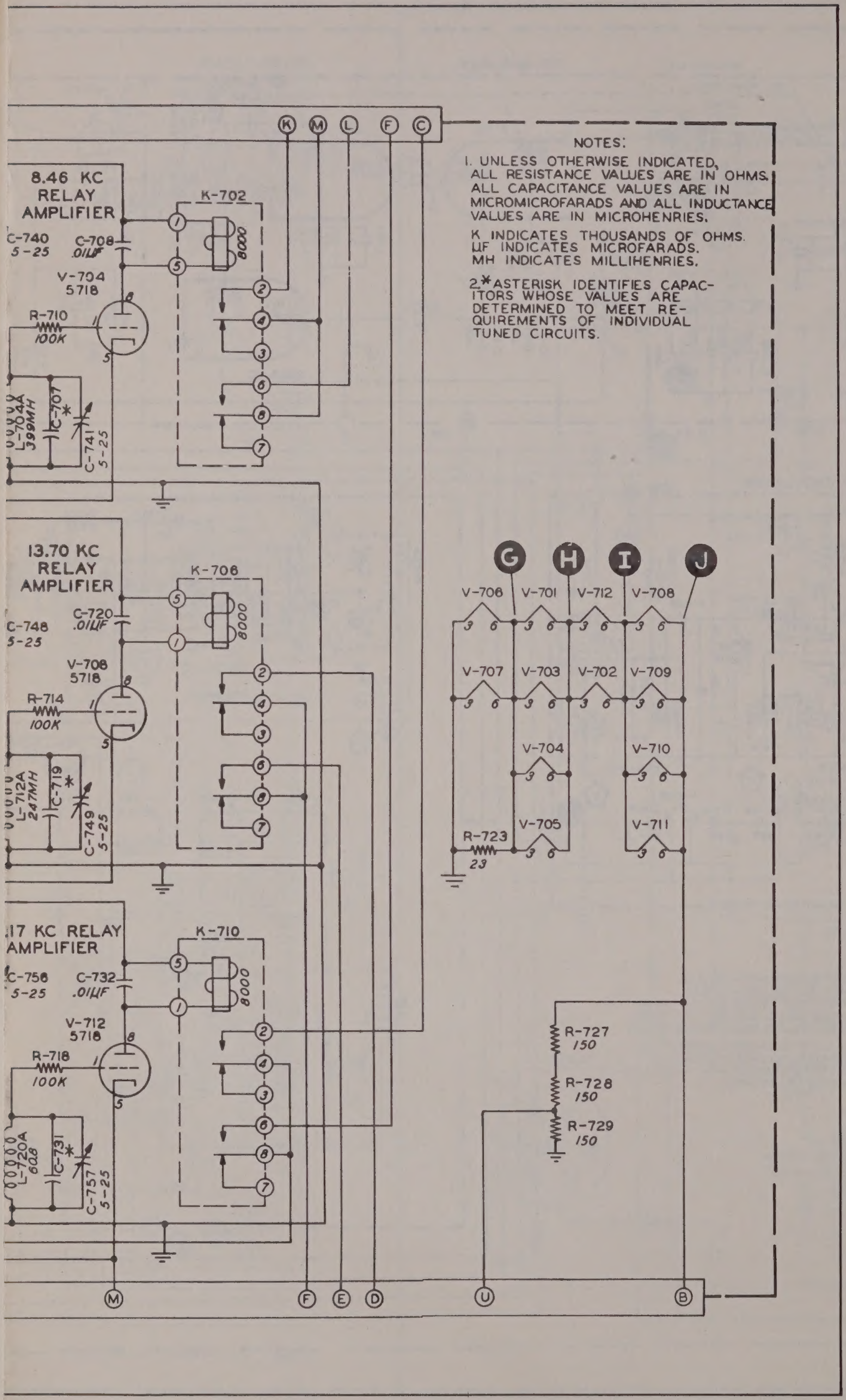
hematic Diagram


RADIO RECEIVER R-425A/ARW-59
406-420 MC
RF AMPLIFIER
RF AMPLIFIER
1ST MXR. GRID T.P.
1ST MIXER
ANTENNA J-601
W-601
322.5 MC
27.5V
21.3V
128V
FIRST OSCILLATOR
OSCILLATOR DOUBLER
1ST OSCILLATOR
TRIPLER
83.5-97.5 MC VARIABLE I-F AMPLIFIER
1ST VARIABLE I-F AMPLIFIER
2ND VARIABLE I-F AMPLIFIER
3RD VARIABLE I-F AMPLIFIER
2ND MIXER
2ND OSCILLATOR
24.9 MC
AVC
CARRIER RELAY CONTROL
24.9 MC FIXED I-F AMPLIFIER
4TH FIXED I-F AMPLIFIER
3RD FIXED I-F AMPLIFIER
2ND FIXED I-F AMPLIFIER
1ST FIXED I-F AMPLIFIER
DISCRIMINATOR
2ND LIMITER
1ST LIMITER
A F CONTROL
CCW CARRIER RELAY CONTROL
AUDIO AND CARRIER RELAY UNIT
TP DISCRIMINATOR AUDIO
AUDIO AMPLIFIER
TP 1ST LIMITER GRID
AUDIO
RELAY CONTROL CIRCUIT
D.C. AMPLIFIER
D.C. AMPLIFIER
THERMAL SWITCH
CARRIER RELAY
EXTERNAL BLOWER
DYNAMOTOR
RED
BLACK
BLUE
WHITE
AUDIO OUTPUT TO J-701 ON AUDIO DECODER KY-55/ARW
RELAY N.C.
RELAY N.O.
RELAY LEAF
1ST LIMITER GRID
MAIN POWER PLUG

NOTE: UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITONCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

K INDICATES THOUSANDS OF OHMS.
MEG INDICATES MILLIONS OF OHMS.
μF INDICATES MICROFARADS.
MH INDICATES MILLIHENRIES.

Figure 7-3. Radio Receiver R-425A/ARW-59, Schematic Diagram



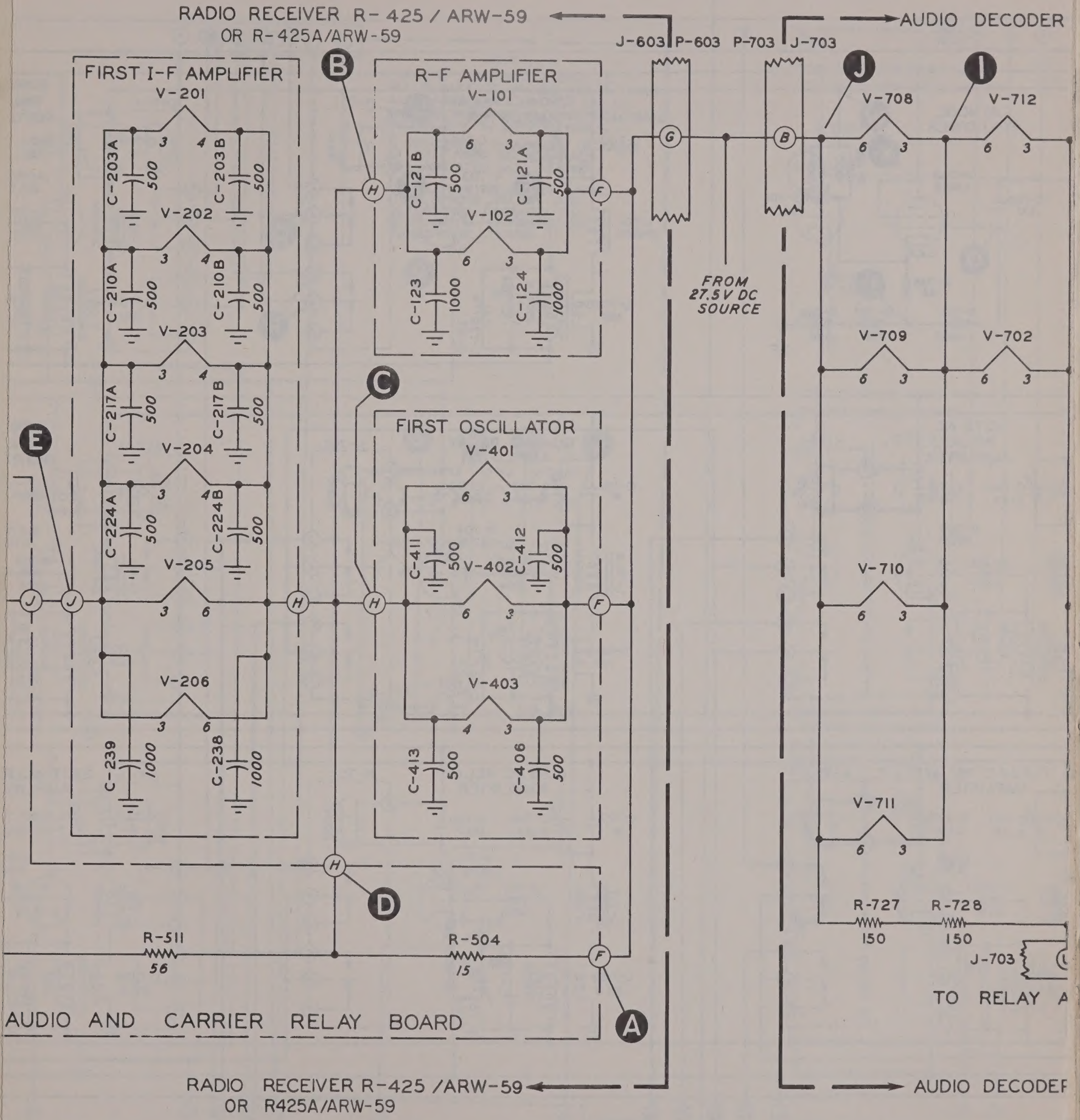
NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

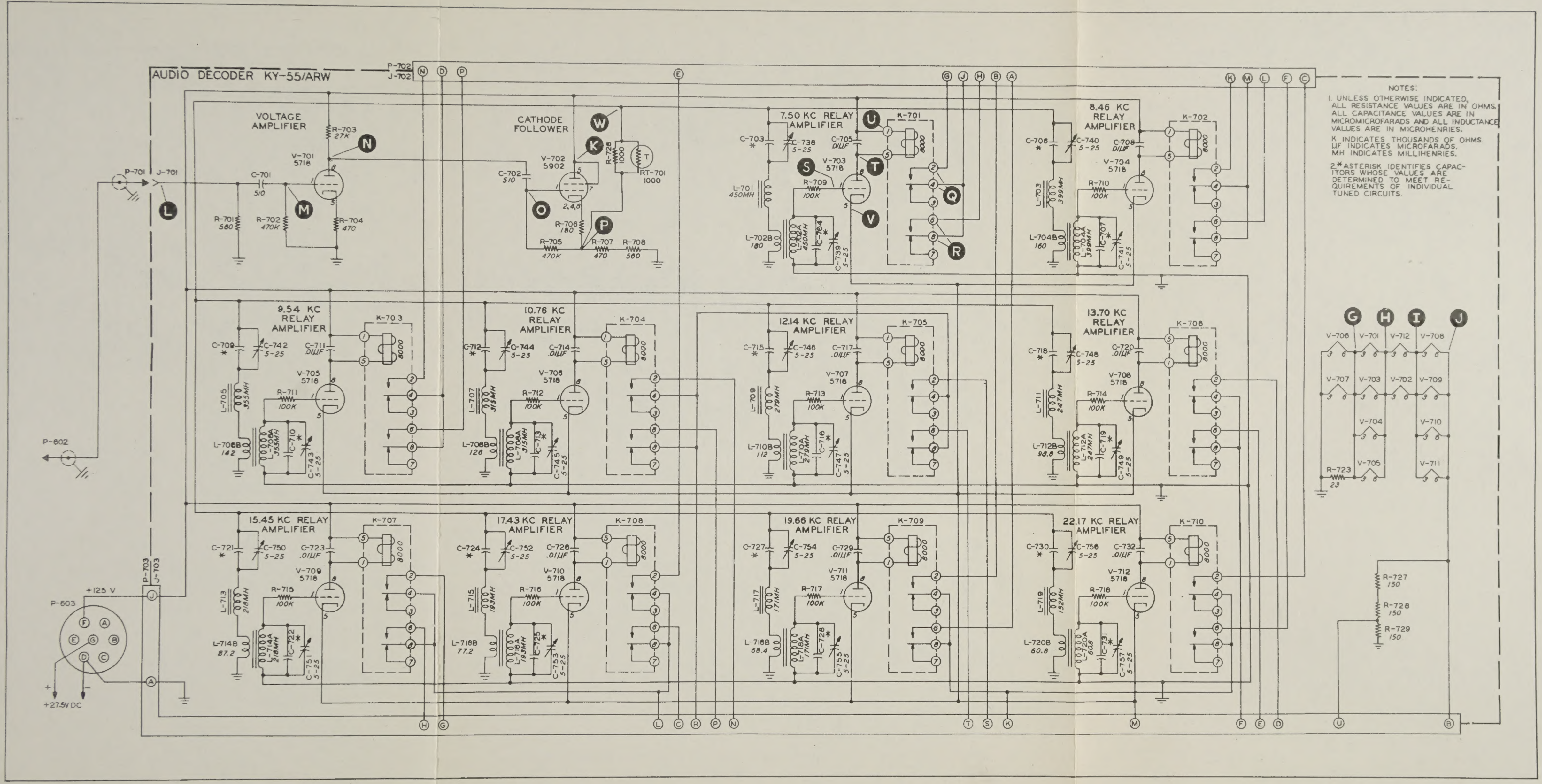
   K INDICATES THOUSANDS OF OHMS.
   µF INDICATES MICROFARADS.
   MH INDICATES MILLIHENRIES.

2. * ASTERISK IDENTIFIES CAPACITORS WHOSE VALUES ARE DETERMINED TO MEET REQUIREMENTS OF INDIVIDUAL TUNED CIRCUITS.

K
M
L
F
C
8.46 KC RELAY AMPLIFIER
K-702
C-740 5-25
C-708 .01µF
V-704 5718
R-710 100K
L-704A 399MH
C-707
*
C-741 5-25
8000
13.70 KC RELAY AMPLIFIER
K-706
C-748 5-25
C-720 .01µF
V-708 5718
R-714 100K
L-712A 247MH
C-719
*
C-749 5-25
8000
17 KC RELAY AMPLIFIER
K-710
C-756 5-25
C-732 .01µF
V-712 5718
R-718 100K
L-720A 608
C-731
*
C-757 5-25
8000
G
H
I
J
V-706
V-701
V-712
V-708
V-707
V-703
V-702
V-709
V-704
V-710
V-705
V-711
R-723 23
R-727 150
R-728 150
R-729 150
M
F
E
D
U
B


RADIO RECEIVER R-425/ARW-59
OR R-425A/ARW-59
AUDIO DECODER
J-603
P-603
P-703
J-703
FIRST I-F AMPLIFIER
V-201
C-203A
500
C-203B
500
V-202
C-210A
500
C-210B
500
V-203
C-217A
500
C-217B
500
V-204
C-224A
500
C-224B
500
V-205
V-206
C-239
1000
C-238
1000
R-F AMPLIFIER
V-101
C-121B
500
C-121A
500
V-102
C-123
1000
C-124
1000
FIRST OSCILLATOR
V-401
C-411
500
V-402
C-412
500
V-403
C-413
500
C-406
500
B
C
D
E
A
J
I
G
B
H
F
FROM
27.5V DC
SOURCE
V-708
V-712
V-709
V-702
V-710
V-711
R-727
150
R-728
150
J-703
TO RELAY A
R-511
56
R-504
15
AUDIO AND CARRIER RELAY BOARD
RADIO RECEIVER R-425/ARW-59
OR R425A/ARW-59
AUDIO DECODER

io Decoder KY-55/ARW,


AUDIO DECODER KY-55/ARW
P-702
J-702
VOLTAGE AMPLIFIER
V-701 5718
R-703 27K
C-701 510
R-701 560
R-702 470K
R-704 470
P-701
J-701
CATHODE FOLLOWER
V-702 5902
C-702 510
R-726 1000
RT-701 1000
R-706 180
R-705 470K
R-707 470
R-708 560
7.50 KC RELAY AMPLIFIER
C-703
C-738 5-25
C-705 .01UF
V-703 5718
K-701
L-701 450MH
R-709 100K
L-702B 180
L-702A 450MH
C-704
C-739 5-25
8.46 KC RELAY AMPLIFIER
C-706
C-740 5-25
C-708 .01UF
V-704 5718
K-702
L-703 399MH
R-710 100K
L-704B 160
L-704A 399MH
C-707
C-741 5-25
9.54 KC RELAY AMPLIFIER
C-709
C-742 5-25
C-711 .01UF
V-705 5718
K-703
L-705 355MH
R-711 100K
L-706B 142
L-706A 355MH
C-710
C-743 5-25
10.76 KC RELAY AMPLIFIER
C-712
C-744 5-25
C-714 .01UF
V-706 5718
K-704
L-707 315MH
R-712 100K
L-708B 126
L-708A 315MH
C-713
C-745 5-25
12.14 KC RELAY AMPLIFIER
C-715
C-746 5-25
C-717 .01UF
V-707 5718
K-705
L-709 279MH
R-713 100K
L-710B 112
L-710A 279MH
C-716
C-747 5-25
13.70 KC RELAY AMPLIFIER
C-718
C-748 5-25
C-720 .01UF
V-708 5718
K-706
L-711 247MH
R-714 100K
L-712B 98.8
L-712A 247MH
C-719
C-749 5-25
15.45 KC RELAY AMPLIFIER
C-721
C-750 5-25
C-723 .01UF
V-709 5718
K-707
L-713 218MH
R-715 100K
L-714B 87.2
L-714A 218MH
C-722
C-751 5-25
17.43 KC RELAY AMPLIFIER
C-724
C-752 5-25
C-726 .01UF
V-710 5718
K-708
L-715 193MH
R-716 100K
L-716B 77.2
L-716A 193MH
C-725
C-753 5-25
19.66 KC RELAY AMPLIFIER
C-727
C-754 5-25
C-729 .01UF
V-711 5718
K-709
L-717 171MH
R-717 100K
L-718B 68.4
L-718A 171MH
C-728
C-755 5-25
22.17 KC RELAY AMPLIFIER
C-730
C-756 5-25
C-732 .01UF
V-712 5718
K-710
L-719 152MH
R-718 100K
L-720B 60.8
L-720A 152MH
C-731
C-757 5-25
8000
P-602
P-603
P-703
J-703
+125 V
+27.5V DC
R-723 23
R-727 150
R-728 150
R-729 150
V-706
V-701
V-712
V-708
V-707
V-703
V-702
V-709
V-704
V-710
V-705
V-711
A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W

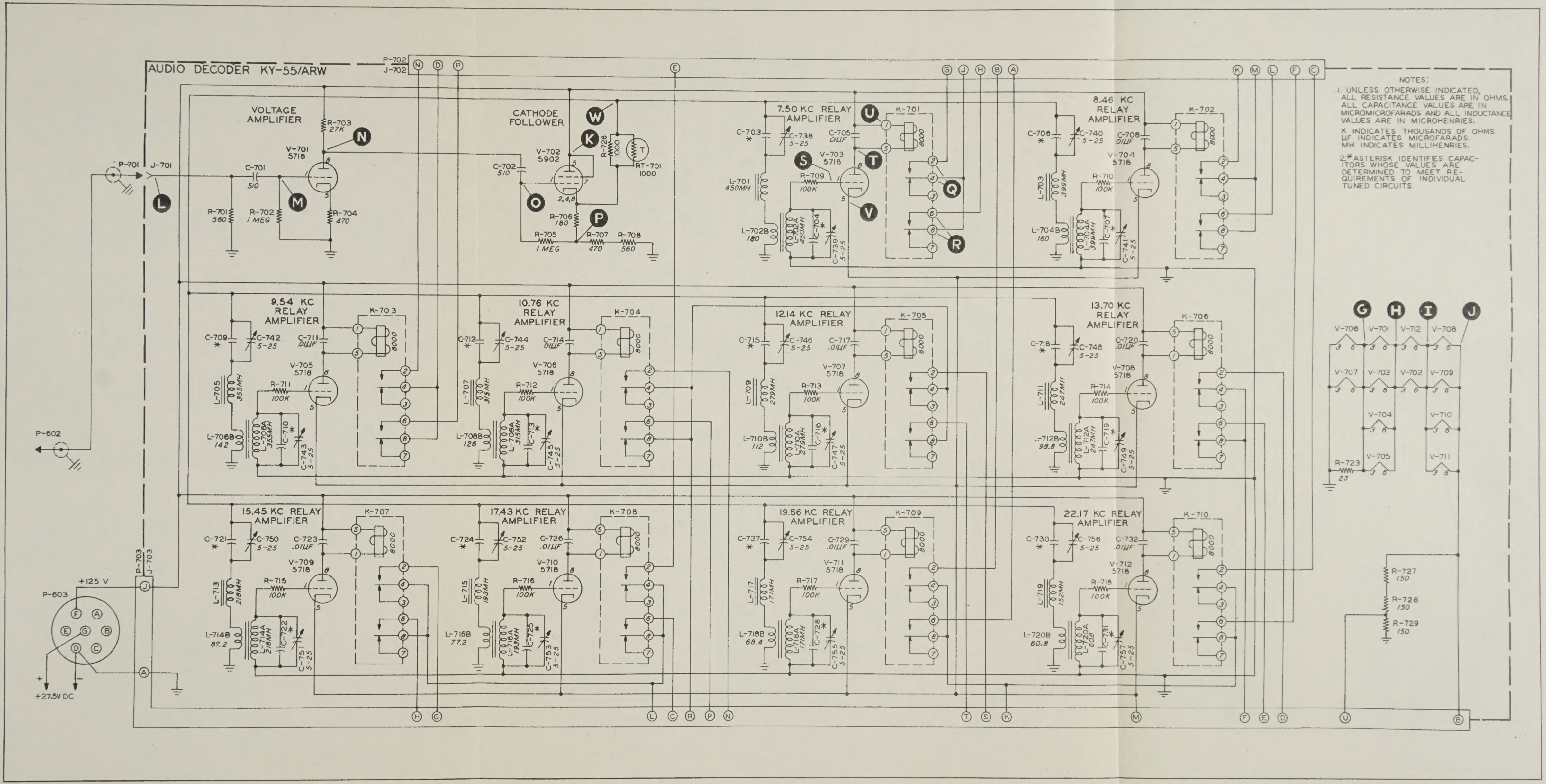
NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

K INDICATES THOUSANDS OF OHMS.
UF INDICATES MICROFARADS.
MH INDICATES MILLIHENRIES.

2. * ASTERISK IDENTIFIES CAPACITORS WHOSE VALUES ARE DETERMINED TO MEET REQUIREMENTS OF INDIVIDUAL TUNED CIRCUITS.

Figure 7-4. Audio Decoder KY-55/ARW, Serial 1 through 233, Schematic Diagram


AUDIO DECODER KY-55/ARW
P-702
J-702
VOLTAGE AMPLIFIER
CATHODE FOLLOWER
7.50 KC RELAY AMPLIFIER
8.46 KC RELAY AMPLIFIER
9.54 KC RELAY AMPLIFIER
10.76 KC RELAY AMPLIFIER
12.14 KC RELAY AMPLIFIER
13.70 KC RELAY AMPLIFIER
15.45 KC RELAY AMPLIFIER
17.43 KC RELAY AMPLIFIER
19.66 KC RELAY AMPLIFIER
22.17 KC RELAY AMPLIFIER
P-701
J-701
P-602
P-603
P-703
J-703
+125 V
+27.5V DC
V-701 5718
V-702 5902
R-703 27K
R-704 470
R-701 560
R-702 1 MEG
C-701 510
C-702 510
R-705 1 MEG
R-706 180
R-707 470
R-708 560
R-726 1000
RT-701 1000
K-701
K-702
K-703
K-704
K-705
K-706
K-707
K-708
K-709
K-710
R-723 23
R-727 150
R-728 150
R-729 150

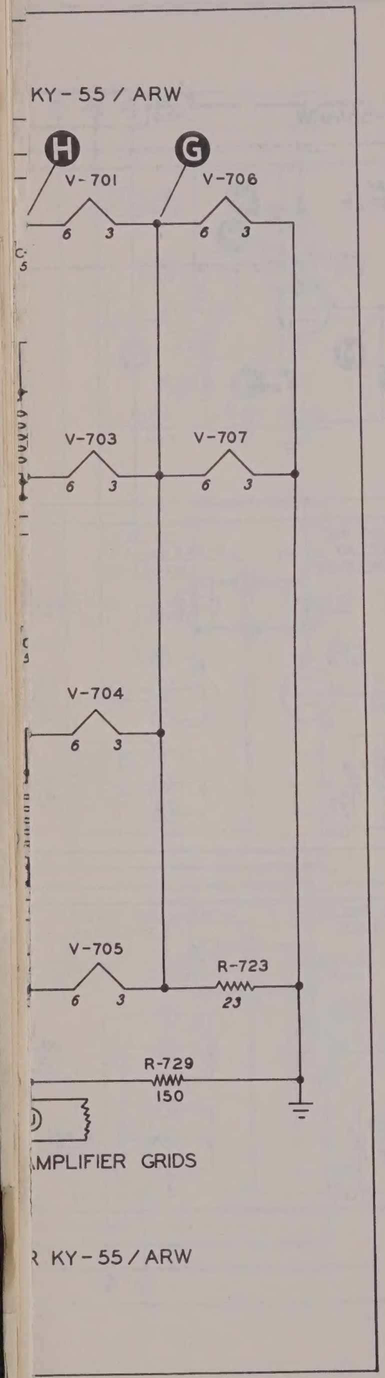
NOTES:

1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITANCE VALUES ARE IN MICROMICROFARADS AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES.

K INDICATES THOUSANDS OF OHMS.
UF INDICATES MICROFARADS.
MH INDICATES MILLIHENRIES.

2. * ASTERISK IDENTIFIES CAPACITORS WHOSE VALUES ARE DETERMINED TO MEET REQUIREMENTS OF INDIVIDUAL TUNED CIRCUITS.

Figure 7-5. Audio Decoder KY-55/ARW, Serial 234 and Above, Schematic Diagram


KY-55 / ARW
H
G
V-701
6
3
V-706
6
3
C
5
V-703
6
3
V-707
6
3
V-704
6
3
V-705
6
3
R-723
23
R-729
150
AMPLIFIER GRIDS
KY-55 / ARW

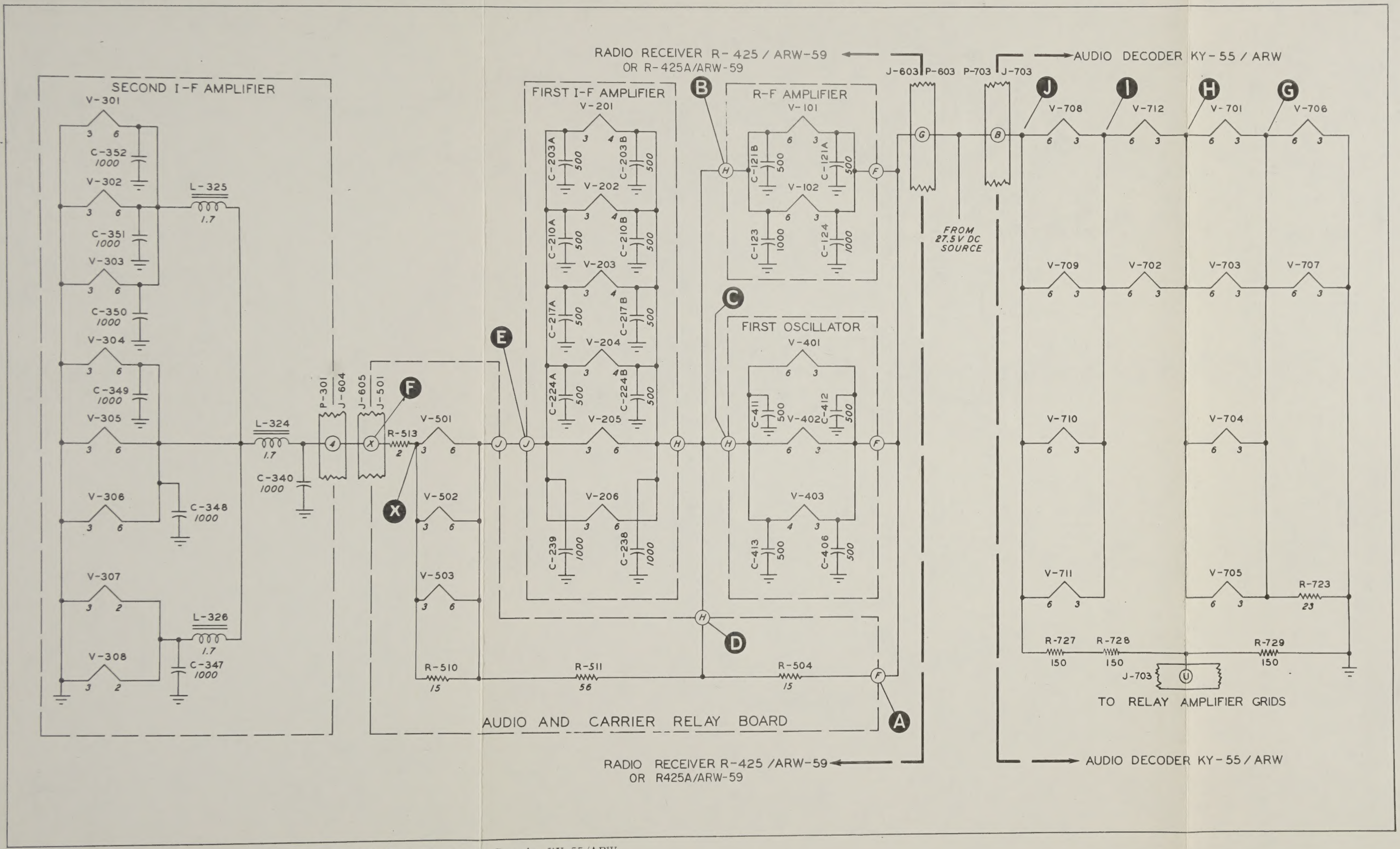

RADIO RECEIVER R-425/ARW-59
OR R-425A/ARW-59
AUDIO DECODER KY-55/ARW
J-603
P-603
P-703
J-703
SECOND I-F AMPLIFIER
V-301
C-352
1000
V-302
L-325
1.7
C-351
1000
V-303
C-350
1000
V-304
C-349
1000
V-305
L-324
1.7
C-340
1000
V-306
C-348
1000
V-307
L-326
1.7
V-308
C-347
1000
P-301
J-604
J-605
J-501
F
X
R-513
2
V-501
V-502
V-503
R-510
15
R-511
56
R-504
15
AUDIO AND CARRIER RELAY BOARD
E
FIRST I-F AMPLIFIER
V-201
C-203A
500
C-203B
500
V-202
C-210A
500
C-210B
500
V-203
C-217A
500
C-217B
500
V-204
C-224A
500
C-224B
500
V-205
V-206
C-239
1000
C-238
1000
B
R-F AMPLIFIER
V-101
C-121B
500
C-121A
500
V-102
C-123
1000
C-124
1000
C
FIRST OSCILLATOR
V-401
C-411
500
V-402
C-412
500
V-403
C-413
500
C-406
500
D
A
FROM
27.5V DC
SOURCE
J
I
H
G
V-708
V-712
V-701
V-706
V-709
V-702
V-703
V-707
V-710
V-704
V-711
V-705
R-723
23
R-727
150
R-728
150
R-729
150
J-703
U
TO RELAY AMPLIFIER GRIDS
RADIO RECEIVER R-425/ARW-59
OR R425A/ARW-59
AUDIO DECODER KY-55/ARW

Figure 7-6. Radio Receiver R-425/ARW-59 or R-425A/ARW-59 and Audio Decoder KY-55/ARW, Filament Diagram

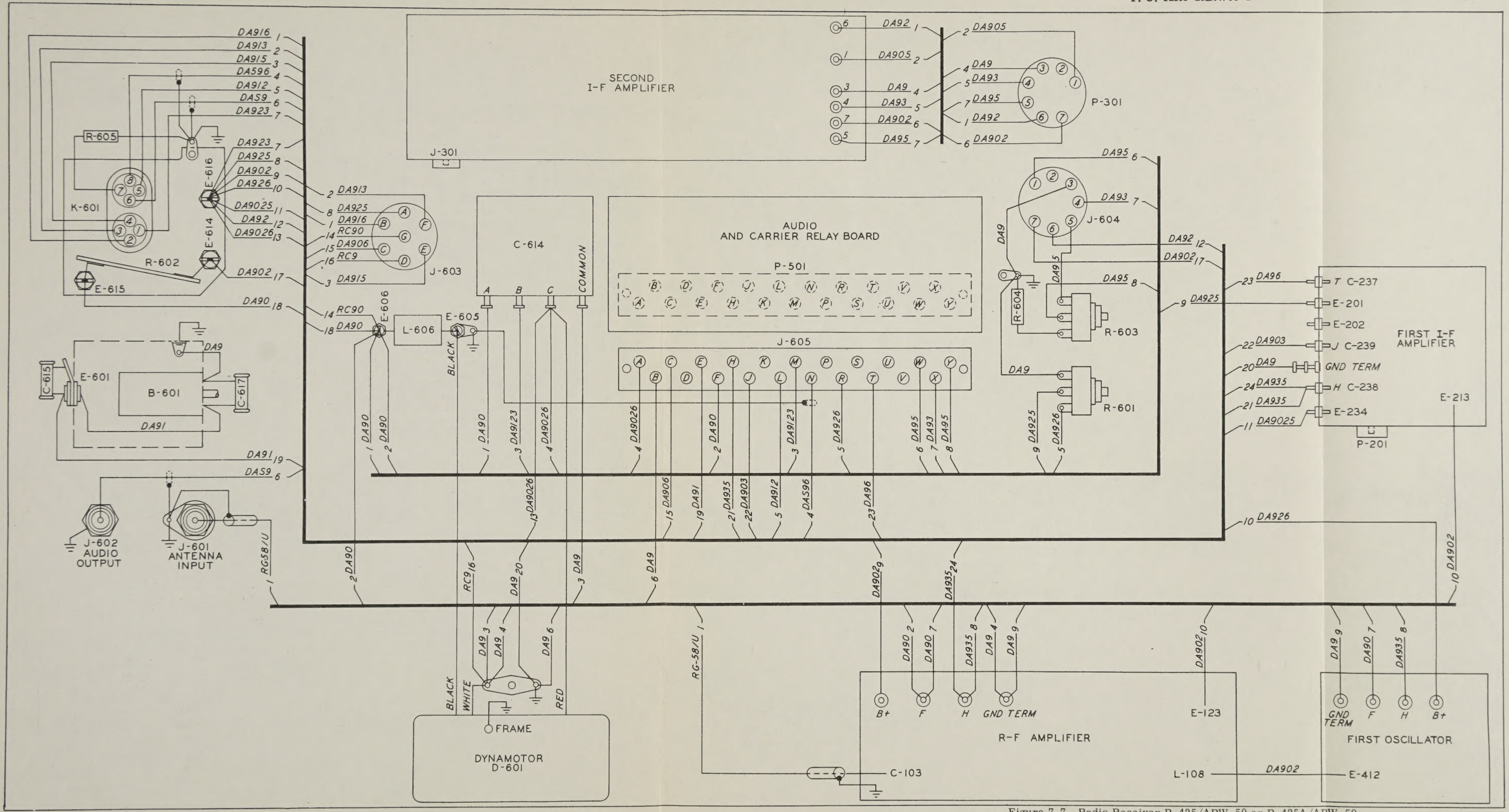
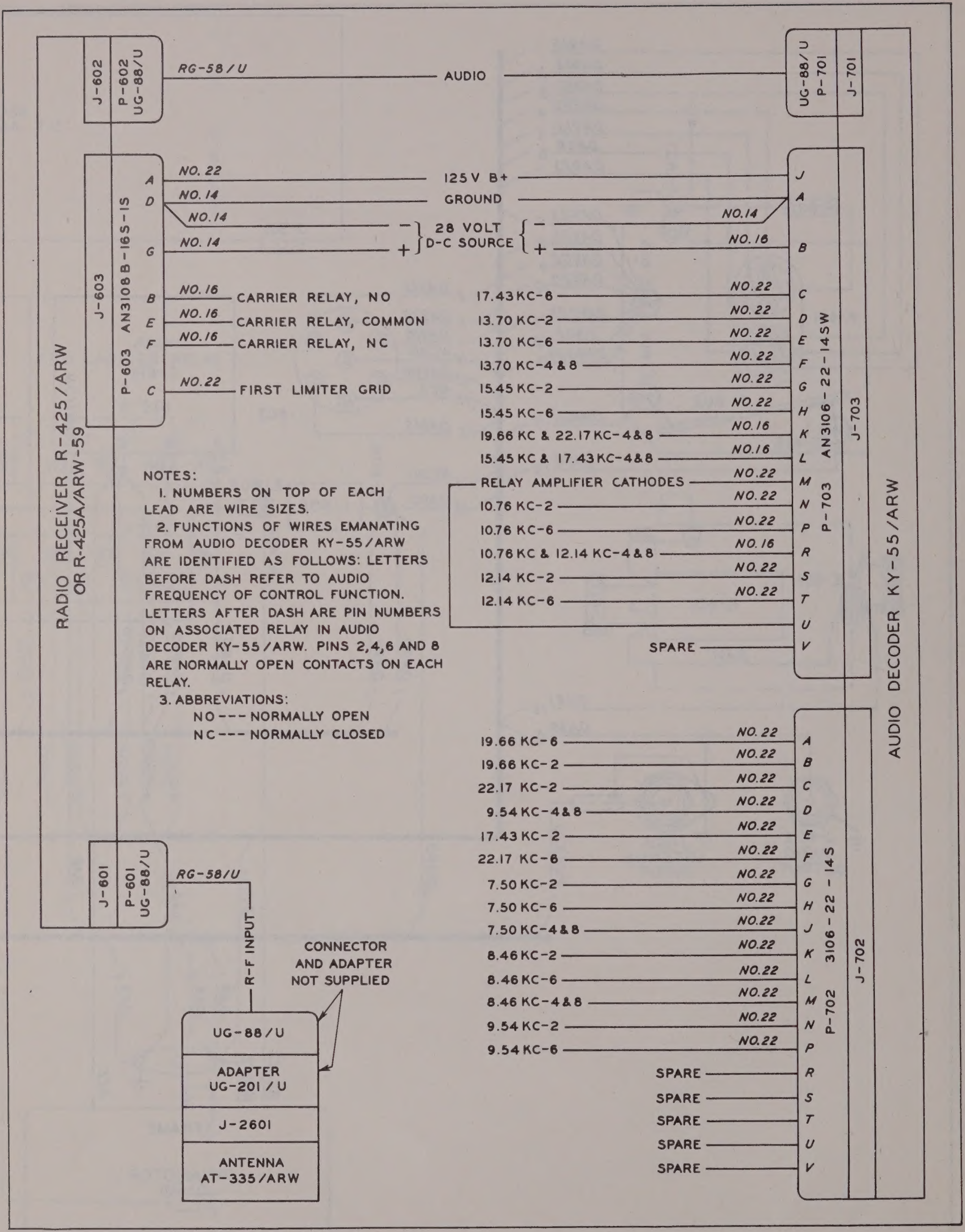

SECOND I-F AMPLIFIER
J-301
P-301
K-601
R-605
E-616
E-614
R-602
E-615
J-603
C-614
A
B
C
COMMON
AUDIO AND CARRIER RELAY BOARD
P-501
J-605
J-604
R-604
R-603
R-601
FIRST I-F AMPLIFIER
T C-237
E-201
E-202
J C-239
GND TERM
H C-238
E-234
P-201
E-213
E-606
L-606
E-605
BLACK
E-601
B-601
C-615
C-617
J-602 AUDIO OUTPUT
J-601 ANTENNA INPUT
RG58/U
DYNAMOTOR D-601
FRAME
BLACK
WHITE
RED
RG-58/U
C-103
R-F AMPLIFIER
B+
F
H
GND TERM
E-123
L-108
DA902
E-412
FIRST OSCILLATOR
GND TERM
F
H
B+
DA916
DA913
DA915
DA596
DA912
DA59
DA923
DA925
DA902
DA926
DA9025
DA92
DA9026
DA90
DA91
RC90
DA906
RC9
DA9
DA93
DA95
DA905
DA96
DA903
DA935
DA9123

Figure 7-7. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Subassembly Interconnection Diagram


RADIO RECEIVER R-425/ARW
OR R-425A/ARW-59
J-602
P-602
UG-88/U
RG-58/U
AUDIO
UG-88/U
P-701
J-701
J-603
P-603 AN3108B-16S-1S
A
D
G
B
E
F
C
NO. 22
125V B+
NO. 14
GROUND
NO. 14
28 VOLT
D-C SOURCE
NO. 14
NO. 16
NO. 16
CARRIER RELAY, NO
NO. 16
CARRIER RELAY, COMMON
NO. 16
CARRIER RELAY, NC
NO. 22
FIRST LIMITER GRID
17.43 KC-6
13.70 KC-2
13.70 KC-6
13.70 KC-4 & 8
15.45 KC-2
15.45 KC-6
19.66 KC & 22.17 KC-4 & 8
15.45 KC & 17.43 KC-4 & 8
RELAY AMPLIFIER CATHODES
10.76 KC-2
10.76 KC-6
10.76 KC & 12.14 KC-4 & 8
12.14 KC-2
12.14 KC-6
SPARE
NO. 22
NO. 16
J A B C D E F G H K L M N P R S T U V
P-703 AN3106-22-14SW
J-703
AUDIO DECODER KY-55/ARW
19.66 KC-6
19.66 KC-2
22.17 KC-2
9.54 KC-4 & 8
17.43 KC-2
22.17 KC-6
7.50 KC-2
7.50 KC-6
7.50 KC-4 & 8
8.46 KC-2
8.46 KC-6
8.46 KC-4 & 8
9.54 KC-2
9.54 KC-6
SPARE
SPARE
SPARE
SPARE
SPARE
A B C D E F G H J K L M N P R S T U V
P-702 3106-22-14S
J-702
J-601
P-601
UG-88/U
RG-58/U
R-F INPUT
CONNECTOR
AND ADAPTER
NOT SUPPLIED
UG-88/U
ADAPTER
UG-201/U
J-2601
ANTENNA
AT-335/ARW

NOTES:

1. NUMBERS ON TOP OF EACH LEAD ARE WIRE SIZES.
2. FUNCTIONS OF WIRES EMANATING FROM AUDIO DECODER KY-55/ARW ARE IDENTIFIED AS FOLLOWS: LETTERS BEFORE DASH REFER TO AUDIO FREQUENCY OF CONTROL FUNCTION. LETTERS AFTER DASH ARE PIN NUMBERS ON ASSOCIATED RELAY IN AUDIO DECODER KY-55/ARW. PINS 2,4,6 AND 8 ARE NORMALLY OPEN CONTACTS ON EACH RELAY.
3. ABBREVIATIONS:
   NO --- NORMALLY OPEN
   NC --- NORMALLY CLOSED

Figure 7-8. Radio Receiver R-425/ARW-59 or R-425A/ARW-59 and Audio Decoder KY-55/ARW, External Wiring Diagram

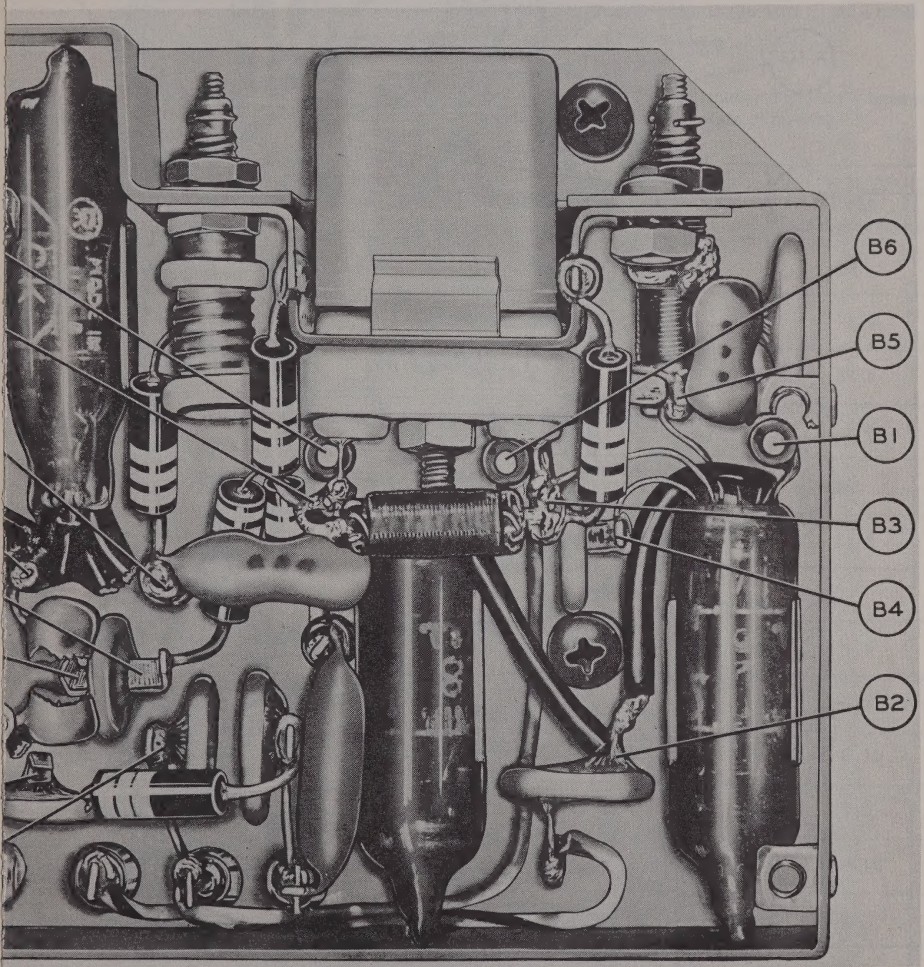
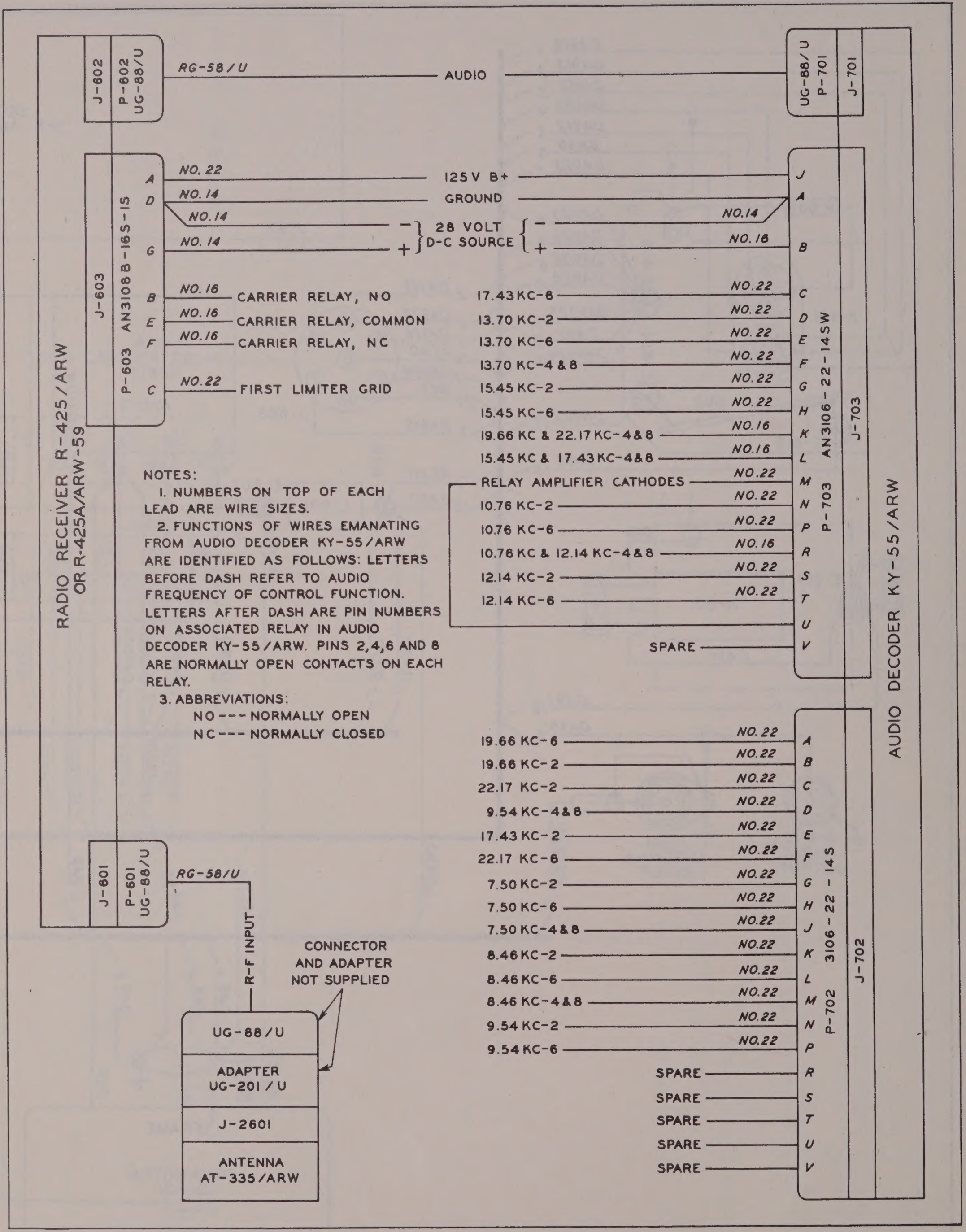

B6
B5
B1
B3
B4
B2

Figure 7-11. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, First Oscillator, Voltage and Resistance Measurements


RADIO RECEIVER R-425/ARW OR R-425A/ARW-59
J-602
P-602 UG-88/U
RG-58/U
AUDIO
UG-88/U P-701
J-701
J-603
P-603 AN3108B-16S-1S
A
D
G
B
E
F
C
NO. 22
125V B+
NO. 14
GROUND
NO. 14
28 VOLT D-C SOURCE
−
+
NO. 14
NO. 18
NO. 16
CARRIER RELAY, NO
NO. 16
CARRIER RELAY, COMMON
NO. 16
CARRIER RELAY, NC
NO. 22
FIRST LIMITER GRID
17.43 KC-6
13.70 KC-2
13.70 KC-6
13.70 KC-4 & 8
15.45 KC-2
15.45 KC-6
19.66 KC & 22.17 KC-4 & 8
15.45 KC & 17.43 KC-4 & 8
RELAY AMPLIFIER CATHODES
10.76 KC-2
10.76 KC-6
10.76 KC & 12.14 KC-4 & 8
12.14 KC-2
12.14 KC-6
SPARE
NO. 22
NO. 16
J A B C D E F G H K L M N P R S T U V
P-703 AN3106-22-14SW
J-703
AUDIO DECODER KY-55/ARW
19.66 KC-6
19.66 KC-2
22.17 KC-2
9.54 KC-4 & 8
17.43 KC-2
22.17 KC-6
7.50 KC-2
7.50 KC-6
7.50 KC-4 & 8
8.46 KC-2
8.46 KC-6
8.46 KC-4 & 8
9.54 KC-2
9.54 KC-6
SPARE
SPARE
SPARE
SPARE
SPARE
A B C D E F G H J K L M N P R S T U V
P-702 3106-22-14S
J-702
J-601
P-601 UG-88/U
RG-58/U
R-F INPUT
CONNECTOR AND ADAPTER NOT SUPPLIED
UG-88/U
ADAPTER UG-201/U
J-2601
ANTENNA AT-335/ARW

NOTES:

1. NUMBERS ON TOP OF EACH LEAD ARE WIRE SIZES.
2. FUNCTIONS OF WIRES EMANATING FROM AUDIO DECODER KY-55/ARW ARE IDENTIFIED AS FOLLOWS: LETTERS BEFORE DASH REFER TO AUDIO FREQUENCY OF CONTROL FUNCTION. LETTERS AFTER DASH ARE PIN NUMBERS ON ASSOCIATED RELAY IN AUDIO DECODER KY-55/ARW. PINS 2,4,6 AND 8 ARE NORMALLY OPEN CONTACTS ON EACH RELAY.
3. ABBREVIATIONS:
   NO --- NORMALLY OPEN
   NC --- NORMALLY CLOSED

Figure 7-8. Radio Receiver R-425/ARW-59 or R-425A/ARW-59 and Audio Decoder KY-55/ARW, External Wiring Diagram

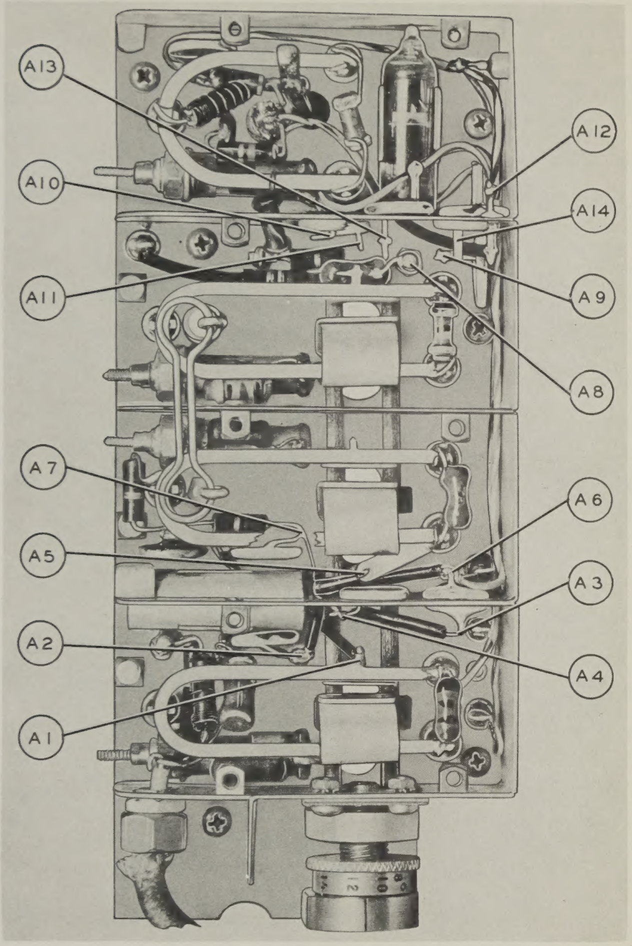


Figure 7-9. Radio Receiver R-425/ARW-59, R-F Amplifier, Voltage and Resistance Measurements

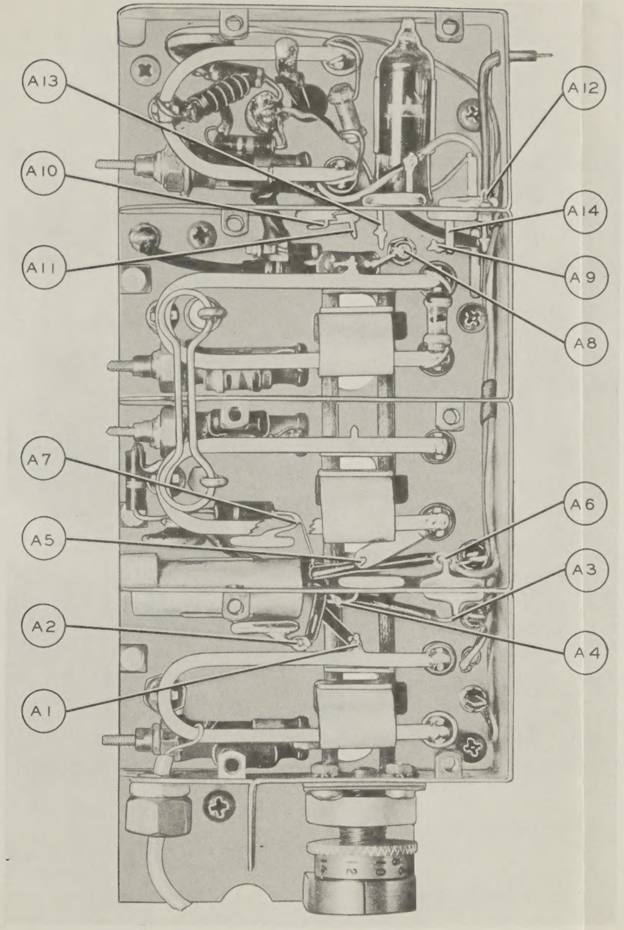


Figure 7-10. Radio Receiver R-425A/ARW-59, R-F Amplifier, Voltage and Resistance Measurements

Conditions of Measurements:

Subassembly connected in normal fashion on a complete receiver chassis. All subassemblies should be in place and properly connected to simulate operating conditions. Input voltage source must deliver 27.5-volt dc at 5 amperes.

Voltage Measurements:

Measurements taken between tube pin and ground with Vacuum Tube Voltmeter TS-375/U (VTVM in table below) or with Multimeter TS-352/U (20,000 Ω/V in table below). No signal input to receiver.

Resistance Measurements:

Measurements are taken with Multimeter TS-352/U between tube pin and ground. Disconnect receiver from all voltage sources while making measurements.

TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND		RESISTANCE TO GROUND
			VTVM	20,000 Ω/V	
V-101 5840	1	A1	0	0	100K or 0*
	2	A2	1.9	1.9	150
	3	A3	27.5	27.5	0.7
	4	A4	1.9	1.9	150
	5	A5	128	128	130
	6	A6	21.3	21.3	1.4
	7	A7	105	105	8300
	8	A2	1.9	1.9	150
V-102 5840	1	A8	-0.2	-0.1	100K
	2	A9	0.15	0.125	150
	3	A10	27.5	27.5	0.7
	4	A11	0.15	0.125	150
	5	A12	128	128	130
	6	A13	21.3	21.3	1.4
	7	A14	21.0	20.5	8.3K
	8	A9	0.15	0.125	150

*Value for Radio Receiver R-425A/ARW-59

ssis. (See paragraph 6-21). All sub-
operation conditions. Input voltage
604, in maximum clockwise position.

Voltmeter TS-375/U (VTVM in table
o signal input to receiver. All signal
secured. Take measurements indi-

andground. Disconnect receiver from
oved for resistance measurements.

OUND 000 Ω /V	RESISTANCE TO GROUND
0	0
2.2	34
6.3	0.8
2.2	34
102	3030
0	0
86	21K
2.2	34
0	0
2.2	33
6.3	0.8
2.2	33
106	2030
0	0
88	20K
2.2	33

TUBE	PIN NO.	TEST POINT	V V'
V-303 5840	1	D15	
	2	D16	
	3	D17	
	4	D18	
	5	D19	
	6	D20	
	7	D21	
	8	D16	
V-304 5840	1	D22	
	2	D23	
	3	D24	
	4	D25	
	5	D26	
	6	D27	
	7	D28	
	8	D23	
V-305 5840	1	D29	va
	2	D29	
	3	D30	
	4	D30	
	5	D31	
	6	D32	
	7	D33	
	8	D30	

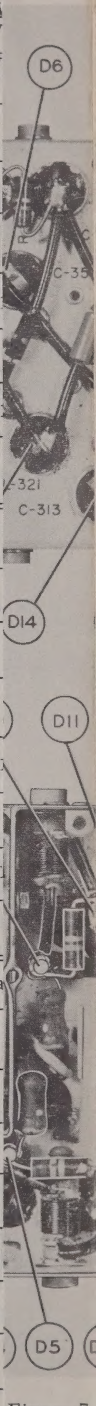


Figure 7-
Secon

Conditions of Measurements:

Subassembly connected in normal fashion on a complete receiver chassis. All subassemblies should be in place and properly connected to simulate operating conditions. Input voltage source must deliver 27.5-volt d-c at 5 amperes.

Voltage Measurements:

Measurements taken between tube pin and ground with Vacuum Tube Voltmeter TS-375/U (VTVM in table below) or with Multimeter TS-352/U (20,000 Ω/V in table below). No signal input to receiver. Crystal Y-401 seated in its socket.

Resistance Measurements:

Measurements are taken with Multimeter TS-352/U between tube pin and ground. Disconnect receiver from all voltage sources while making measurements.

TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND		RESISTANCE TO GROUND
			VTVM	20,000 Ω/V	
V-401 5718	1	B1	0	0	10
	3	B2	27.5	27.5	0.7
	5	B3	2.4	2.4	110
	6	B4	21.3	21.3	1.4
	8	B5	128	128	130
V-402 5718	1	B6	0 to -5	0	10K
	3	B2	27.5	27.5	0.7
	5	B7	2.4	2.4	110
	6	B4	21.3	21.3	1.4
	8	B8	128	128	130
V-403 5702	1	B9	128	128	30
	2	B10	125	125	1030
	3	B11	27.5	27.5	0.7
	4	B12	21.3	21.3	1.4
	5	B13	0	0	0
	6	B14	1.8	1.8	200
	7	B15	7.0	0.75	100K

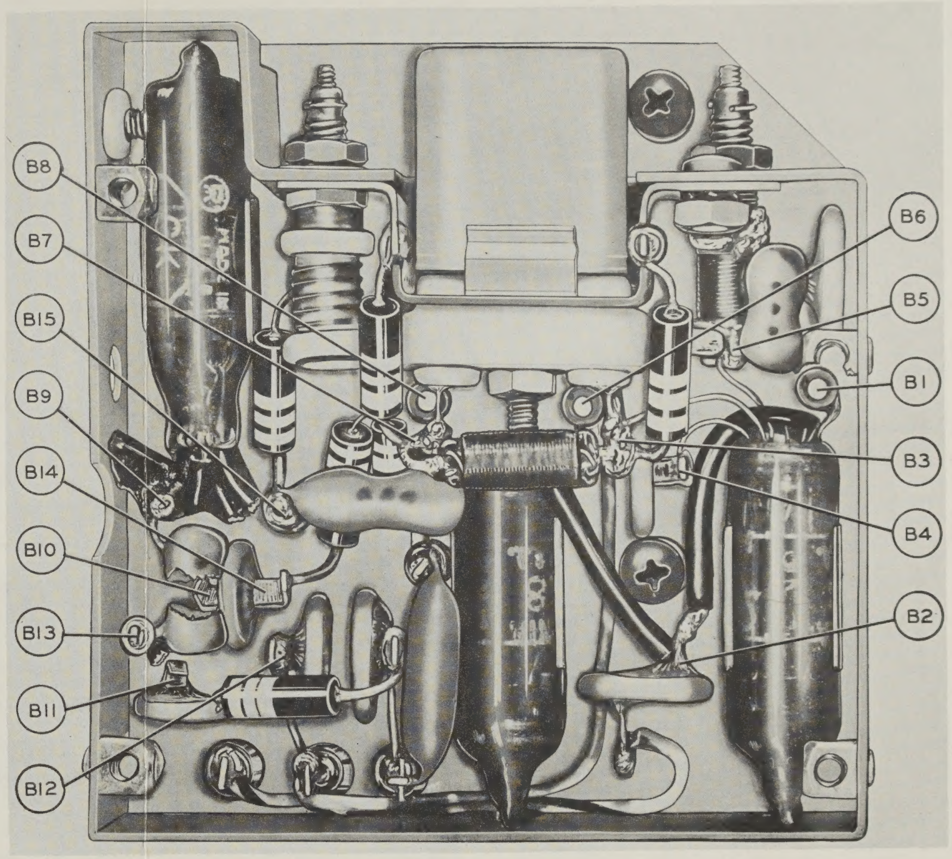


Figure 7-11. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, First Oscillator, Voltage and Resistance Measurements

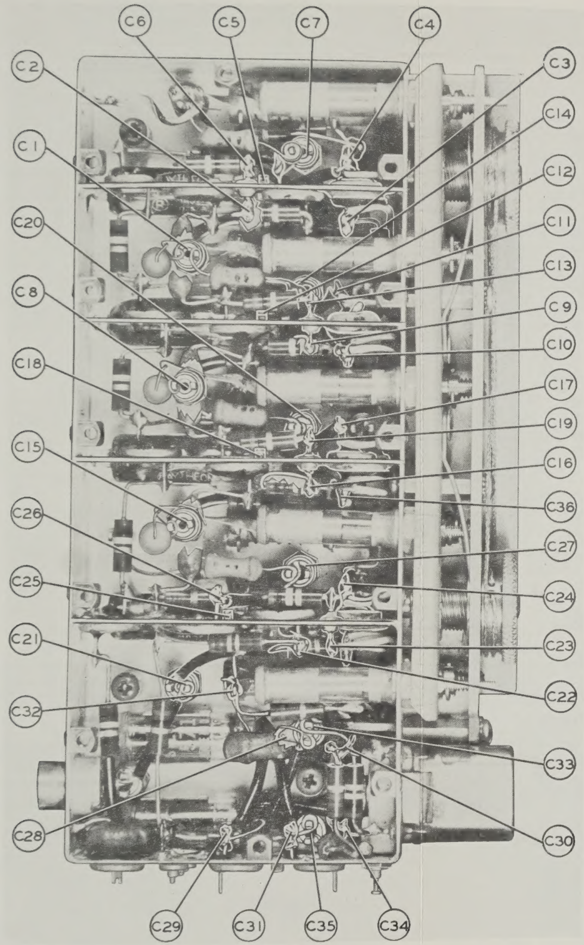


Figure 7-12. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, First I-F Amplifier, Voltage and Resistance Measurements

Conditions of Measurements:

Subassembly connected in normal fashion on a complete receiver chassis. All subassemblies should be in place and properly connected to simulate operating conditions. Input voltage source must deliver 27.5-volt dc at 5 amperes.

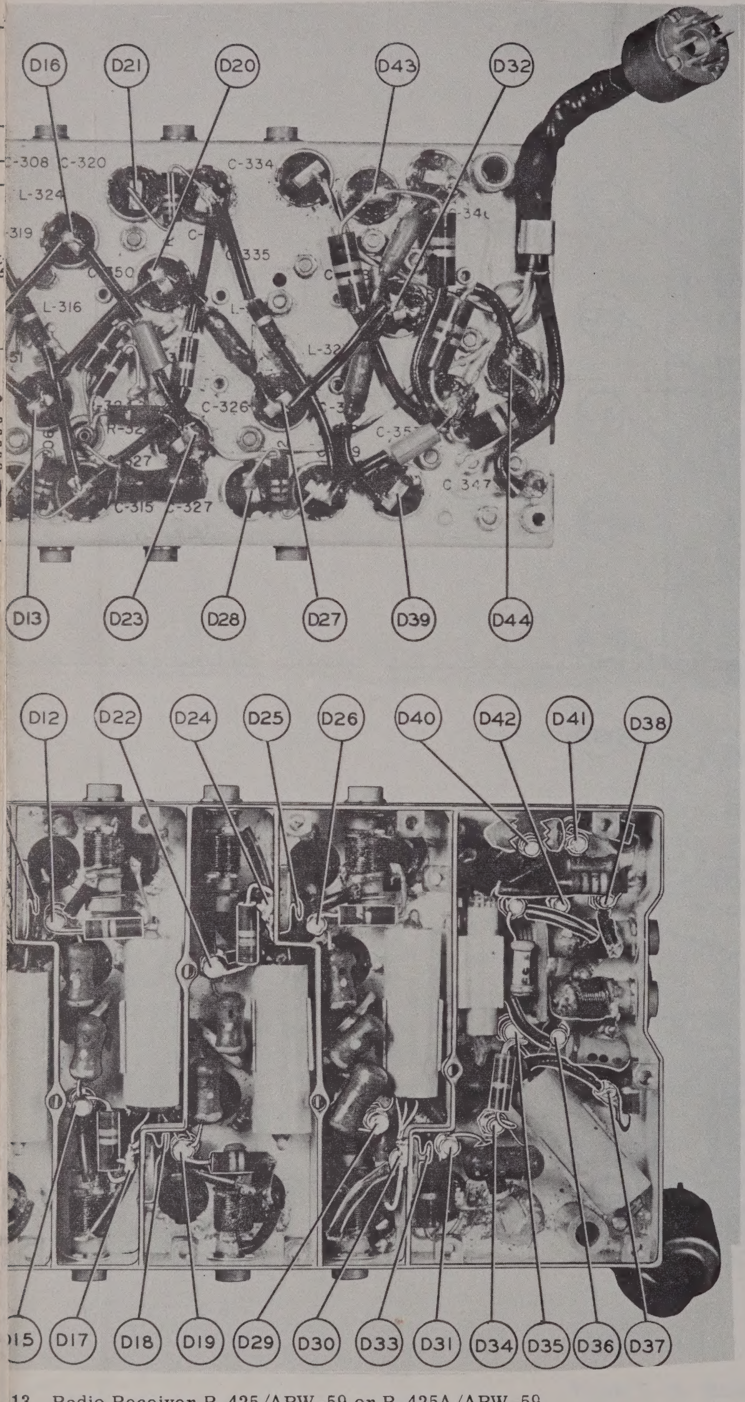
Voltage Measurements:

Measurements taken between tube pin and ground with Vacuum Tube Voltmeter TS-375/U (VTVM in table below) or with Multimeter TS-352/U (20,000 Ω/V in table below). No signal input to receiver. Crystal Y-401 and any second oscillator crystal (Y-201 through Y-215) seated in their sockets.

Resistance Measurements:

Measurements are taken with Multimeter TS-352/U between tube pin and ground. Disconnect receiver from all voltage sources while making measurements.

TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND		RESISTANCE TO GROUND
			VTVM	20,000 Ω/V	
V-201 5702	1	C1	128	128	130
	2	C2	128	128	140
	3	C3	15.0	15.0	1.7
	4	C4	21.3	21.3	1.4
	5	C5	0	0	0
	6	C6	3.8	3.8	220
	7	C7	-0.75	-0.75	780K
V-202 5702	1	C8	128	128	130
	2	C9	128	128	140
	3	C10	15.0	15.0	1.7
	4	C11	21.3	21.3	1.4
	5	C12	0	0	0
	6	C13	3.8	3.8	220
	7	C14	-0.75	-0.05	680K
V-203 5702	1	C15	128	128	130
	2	C16	128	128	140
	3	C36	15.0	15.0	1.7
	4	C17	21.3	21.3	1.4
	5	C18	0	0	0
	6	C19	3.8	3.8	220
	7	C20	-0.75	-0.05	580K
V-204 5702	1	C21	100	100	4,200
	2	C22	29.5	29.5	8,800
	3	C23	15.0	15.0	1.7
	4	C24	21.3	21.3	1.4
	5	C25	0	0	0
	6	C26	0.325	0.325	220
	7	C27	-0.95	-0.7	100K
V-205 5718	1	C28	0	0	0
	3	C29	15.0	15.0	1.7
	5	C30	2.2	2.2	110
	6	C31	21.3	21.3	1.4
	8	C32	128	128	130
V-206 5718	1	C33	0 to -2.2	0	100K
	3	C29	15.0	15.0	1.7
	5	C34	2.2	2.2	110
	6	C31	21.3	21.3	1.4
	8	C35	128	128	130


D16
D21
D20
D43
D32
C-308
C-320
C-334
L-324
319
C-350
L-316
C-335
L-32
C-326
R-32
C-315
C-327
C-35
C 347
D13
D23
D28
D27
D39
D44
D12
D22
D24
D25
D26
D40
D42
D41
D38
15
D17
D18
D19
D29
D30
D33
D31
D34
D35
D36
D37

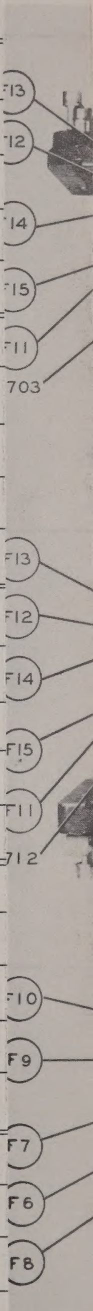
13. Radio Receiver R-425/ARW-59 or R-425A/ARW-59,
d I-F Amplifier, Voltage and Resistance Measurements

V and 128 V dc. No audio signal input
ound with Multimeter TS-352/U.

measurements between test point and

GE TO ND	RESISTANCE TO GROUND
	470K 1 meg. **
9	3
	470
8	5
	infinite
	470K 1 meg. **
	1200
8	5
	1200
*	infinite
6	7
*	infinite
	1200
	100K
9	3
	infinite
8	5
	infinite
W	

TUBE	PIN NO.	TEST POINT
V-704	1	F11
	3	F12
	5	F13
	6	F14
	8	F15
V-705	1	F11
	3	F12
	5	F13
	6	F14
	8	F15
V-706	1	F11
	3	F12
	5	F13
	6	F14
	8	F15
V-707	1	F11
	3	F12
	5	F13
	6	F14
	8	F15
V-708	1	F11
	3	F12
	5	F13
	6	F14
	8	F15


13
12
14
15
11
703
F13
F12
F14
F15
F11
712
F10
F9
F7
F6
F8

e 7-15.

Conditions of Measurement:

Subassembly connected in normal fashion on a complete receiver chassis. (See paragraph 6-21). All subassemblies should be in place and properly connected to simulate operation conditions. Input voltage source must deliver 27.5-volt dc at 5 amperes. AF CONTROL, R-604, in maximum clockwise position.

Voltage Measurements:

Measurements taken between tube pin and ground with Vacuum Tube Voltmeter TS-375/U (VTVM in table below) or with Multimeter TS-352/U (20,000 Ω /V in table below). No signal input to receiver. All signal voltage measurements taken with shield in place on unit and properly secured. Take measurements indicated on top photograph at the right.

Resistance Measurements:

Measurements are taken with Multimeter TS-352/U between tube pin and ground. Disconnect receiver from all voltage sources while making measurements. Shield may be removed for resistance measurements.

TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND		RESISTANCE TO GROUND
			VTVM	20,000 Ω /V	
V-301 5840	1	D1	0	0	0
	2	D2	2.2	2.2	34
	3	D3	6.3	6.3	0.8
	4	D4	2.2	2.2	34
	5	D5	102	102	3030
	6	D6	0	0	0
	7	D7	86	86	21K
	8	D2	2.2	2.2	34
V-302 5840	1	D8	0	0	0
	2	D9	2.2	2.2	33
	3	D10	6.3	6.3	0.8
	4	D11	2.2	2.2	33
	5	D12	106	106	2030
	6	D13	0	0	0
	7	D14	88	88	20K
	8	D9	2.2	2.2	33
V-303 5840	1	D15	0	0	0
	2	D16	2.2	2.2	22.5
	3	D17	6.3	6.3	0.8
	4	D18	2.2	2.2	32.5
	5	D19	117	117	1030
	6	D20	0	0	0
	7	D21	102	102	19K
	8	D16	2.2	2.2	32.5
V-304 5840	1	D22	0	0	0
	2	D23	2.2	2.2	32
	3	D24	6.3	6.3	0.8
	4	D25	2.2	2.2	32
	5	D26	128	128	30
	6	D27	0	0	0
	7	D28	108	108	18K
	8	D23	2.2	2.2	32
V-305 5840	1	D29	variable	variable	12K
	2	D29	0	0	0
	3	D30	6.3	6.3	0.8
	4	D30	0	0	0
	5	D31	50	50	10.2K
	6	D32	0	0	0
	7	D33	70	70	6.5K
	8	D30	0	0	0
V-306 5840	1	D34	-3.6	-0.85	8.2K
	2	D35	0	0	0
	3	D32	6.3	6.3	0.8
	4	D35	0	0	0
	5	D36	77	77	4.8K
	6	D35	0	0	0
	7	D37	75	75	5.8K
	8	D35	0	0	0
V-307 5647	1	D38	-20	-18	18K
	2	D39	0	0	0
	3	D40	6.3	6.3	0.8
	4	D41	1.0	0.75	36K
V-308 5647	1	D42	-26	-2.5	18K
	2	D39	0	0	0
	3	D40	6.3	6.3	0.8
	4	D40	0	0	0
C-337		D43	68	68	5K
C-343		D44	80	80	8K

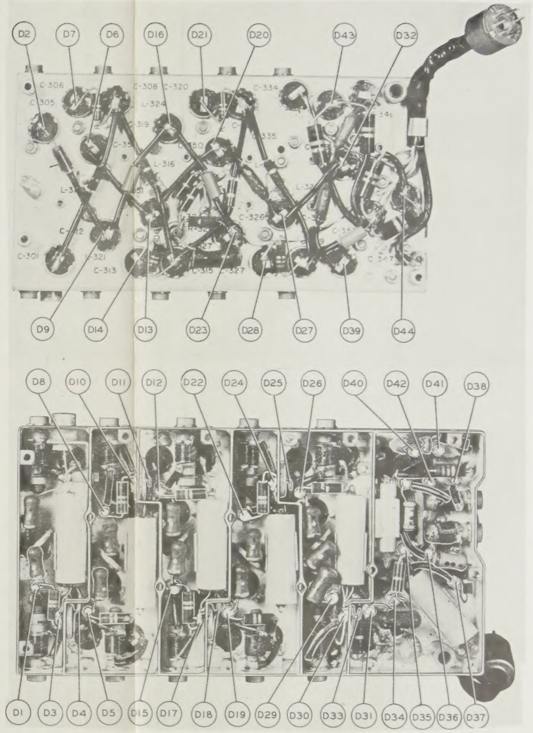

D2
D7
D6
D16
D21
D20
D43
D32
C-306
C-305
C-308
C-320
L-324
C-319
C-334
C-335
L-316
C-326
C-312
C-301
L-321
C-313
C-315
C-327
C-347
D9
D14
D13
D23
D28
D27
D39
D44
D8
D10
D11
D12
D22
D24
D25
D26
D40
D42
D41
D38
D1
D3
D4
D5
D15
D17
D18
D19
D29
D30
D33
D31
D34
D35
D36
D37

Figure 7-13. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Second I-F Amplifier, Voltage and Resistance Measurements

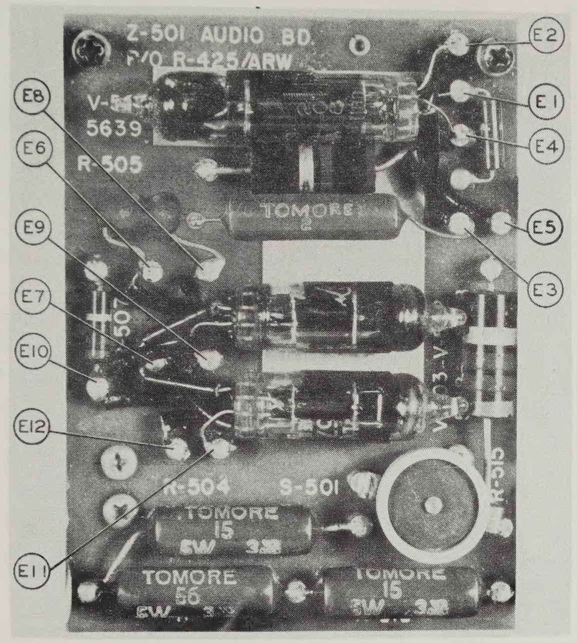

Z-501 AUDIO BD.
P/O R-425/ARW
E2
E8
E1
V-501
5639
E4
E6
R-505
TOMORE
E9
E5
E3
E7
507
E10
V-503
E12
R-504
S-501
R-515
TOMORE
15
5W
E11
TOMORE
56
5W
TOMORE
15
5W

Figure 7-14. Radio Receiver R-425/ARW-59 or R-425A/ARW-59, Audio and Carrier Relay Board, Voltage and Resistance Measurements

Conditions of Measurement:

Subassembly connected in normal fashion on a complete receiver chassis. All subassemblies should be in place and properly connected to simulate operating conditions. Input voltage source must deliver 27.5-volt d-c at 5 amperes. Connect a 560-ohm, 2-watt resistor from A-F OUT connector, J-602, to ground.

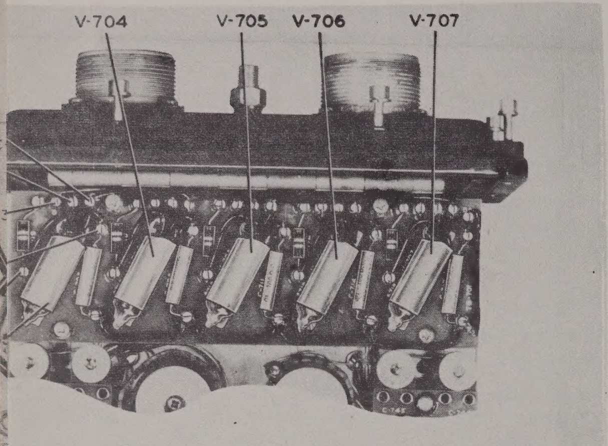
Voltage Measurements:

Measurements taken between tube pin and ground with Vacuum Tube Voltmeter TS-375/U (VTVM in table below) or with Multimeter TS-352/U (20,000 Ω/V in table below). No signal input to receiver.

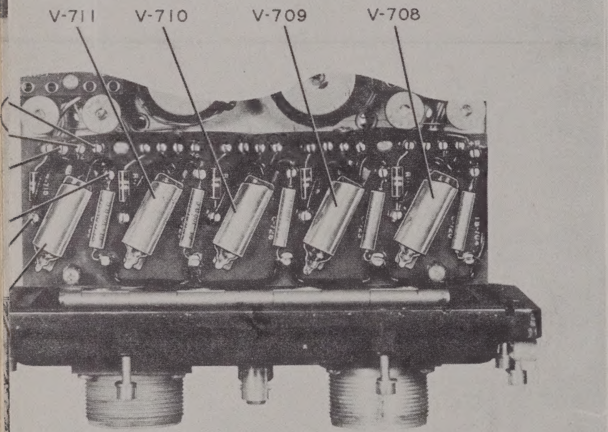
Resistance Measurements:

Measurements are taken with Multimeter TS-352/U between tube pin and ground. Disconnect receiver from all voltage sources while making measurements.

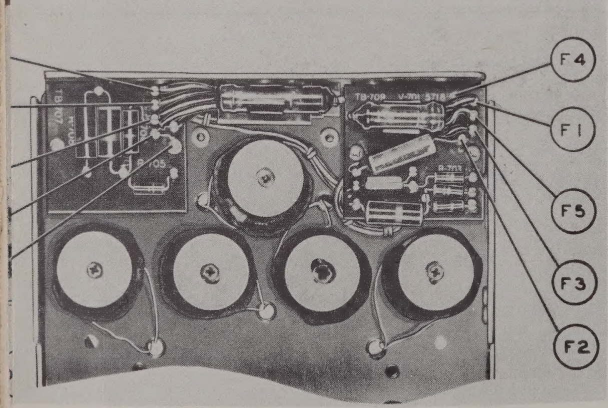
TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND		RESISTANCE TO GROUND
			VTVM	20,000 Ω/V	
V-501 5639	1	E1	14.5	3.8	226K
	2	E2	16.5	16.5	51.7K
	3	E3	6.9	6.9	1.7
	4	E2	16.5	16.5	51.7K
	5	E4	102	102	30
	6	E5	13.8	13.8	1.7
	7	E4	102	102	30
	8	E2	16.5	16.5	51.7K
V-502 5718	1	E6	-0.85	-0.4	840K
	3	E7	6.9	6.9	1.7
	5	E8	0	0	0
	6	E9	13.8	13.8	1.7
	8	E10	20	18	2.2 meg.
V-503 5718	1	E10	20	18	2.2 meg.
	3	E7	6.9	6.9	1.7
	5	E11	27.5	27.5	0.7
	6	E9	13.8	13.8	1.7
	8	E12	128	128	8000


V-704
V-705
V-706
V-707

TOP VIEW


V-711
V-710
V-709
V-708

BOTTOM VIEW


F4
F1
F5
F3
F2

udio Decoder **KY-55/ARW, Voltage and Resistance Measure**ments

SECTION VIII
DIFFERENCE DATA SHEETS

INTRODUCTION

Service instructions for models included in this section are the same as the procedures for Radio Receiver R-425A/ARW-59 except for the specific differences noted by the applicable Difference Data Sheets. Sections I through VII contain complete service instruction information for Radio Receiver R-425A/ARW-59.

INDEX OF MODELS COVERED

NOMENCLATURE	DESIGNATION	PAGE
Radio Receiver	R-425B/ARW-59	84C

Conditions of Measurement:

Voltage Measurements:

Connect as shown in figure 5-2. Input voltages to unit, 27.5 V and 128 V dc. No audio signal input applied to J-701. Measurements taken between test point and ground with Multimeter TS-352/U.

Resistance Measurements:

Disconnect all plugs from Audio Decoder KY-55/ARW. Take measurements between test point and ground with Multimeter TS-352/U.

TUBE	PIN NO.	TEST POINT	VOLTAGE TO GROUND	RESISTANCE TO GROUND
V-701	1	F1	0	470K 1 meg. **
	3	F2	6.9	3
	5	F3	1	470
	6	F4	13.8	5
	8	F5	60	infinite
V-702	1	F6	17	470K 1 meg. **
	2	F7	40	1200
	3	F8	13.8	5
	4	F7	40	1200
	5	F9	128 *	infinite
	6	F10	20.6	7
	7	F9	128 *	infinite
	8	F7	40	1200
V-703	1	F11	0	100K
	3	F12	6.9	3
	5	F13	9	infinite
	6	F14	13.8	5
	8	F15	128	infinite
V-704	1	F11	0	100K
	3	F12	6.9	3
	5	F13	9	infinite
	6	F14	13.8	5
	8	F15	128	infinite
V-705	1	F11	0	100K
	3	F12	6.9	3
	5	F13	9	infinite
	6	F14	13.8	5
	8	F15	128	infinite
V-706	1	F11	0	100K
	3	F12	0	0
	5	F13	9	infinite
	6	F14	6.9	3
	8	F15	128	infinite
V-707	1	F11	0	100K
	3	F12	0	0
	5	F13	9	infinite
	6	F14	6.9	3
	8	F15	128	infinite
V-708	1	F11	0	100K
	3	F12	20.6	7
	5	F13	9	infinite
	6	F14	27.5	8
	8	F15	128	infinite
V-709	1	F11	0	100K
	3	F12	20.6	7
	5	F13	9	infinite
	6	F14	27.5	8
	8	F15	128	infinite
V-710	1	F11	0	100K
	3	F12	20.6	7
	5	F13	9	infinite
	6	F14	27.5	8
	8	F15	128	infinite
V-711	1	F11	0	100K
	3	F12	20.6	7
	5	F13	9	infinite
	6	F14	27.5	8
	8	F15	128	infinite
V-712	1	F11	0	100K
	3	F12	13.8	5
	5	F13	9	infinite
	6	F14	20.6	7
	8	F15	128	infinite

* Dc input voltage to Audio Decoder KY-55/ARW
** Values for serial no. 234 through 300

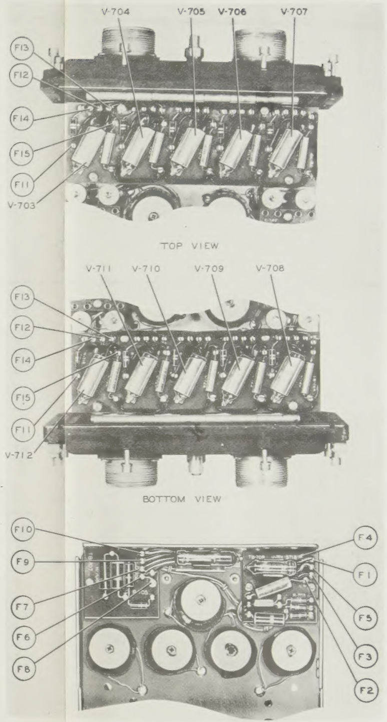


Figure 7-15. Audio Decoder KY-55/ARW, Voltage and Resistance Measurements

SECTION VIII
DIFFERENCE DATA SHEETS

INTRODUCTION

Service instructions for models included in this section are the same as the procedures for Radio Receiver R-425A/ARW-59 except for the specific differences noted by the applicable Difference Data Sheets. Sections I through VII contain complete service instruction information for Radio Receiver R-425A/ARW-59.

INDEX OF MODELS COVERED

NOMENCLATURE	DESIGNATION	PAGE
Radio Receiver	R-425B/ARW-59	84C

Radio Receiver R-425B/ARW-59

The instructions contained in preceding sections of this handbook apply except for the differences given in this data sheet.

DESCRIPTION AND LEADING PARTICULARS

Same as for Radio Receiver R-425A/ARW-59 except change paragraph 1-36, add new paragraph 1-36A, and change Table X.

1-36. FIRST I-F AMPLIFIER TUNING. Refer to figure 6-3. The first i-f amplifier tuning control consists of two knobs, which are ganged by use of a braided wire dial cable, projecting from the first i-f amplifier subassembly on the right side of the receiver. Tune the i-f amplifier by rotating both knobs simultaneously in unison such that each dial is rotated to the desired channel setting. Detents are provided to hold the control against the effects of mechanical vibration and to facilitate positioning the control. The first i-f amplifier tuning control varies the position of a slug rack. The slug rack positions the powdered iron slugs associated with the four variable i-f amplifier tank coils and the second oscillator tank coil.

1-36A. Simultaneous rotation of the first i-f tuning knobs is a two-hand operation and should be performed in accordance with paragraph 1-36. Rotation of only one tuning knob will cause unequal rotation of the other knob and therefore, result in stretching of the dial cable (due to excessive strain), jammed tuners, and de-tuned high i-f.

TEST EQUIPMENT AND SPECIAL TOOLS

Same as for Radio Receiver R-425A/ARW-59.

PREPARATION FOR USE AND RESHIPMENT

Same as for Radio Receiver R-425A/ARW-59 except add caution preceding step a, paragraph 3-8; change step a, paragraph 3-8; and remove note following step a, paragraph 3-8.

CAUTION

Improper first i-f amplifier tuning may cause damage to equipment. Refer to paragraph 1-36 and 1-36A of this difference data section before performing the following step.

a. Using both hands, tune the first i-f amplifier by simultaneously rotating both first i-f tuning dials to the position indicated in Table XXIV. The tuning dials have detents which position each dial accurately.

TABLE XXIV. TUNING DATA

DESIRED INPUT FREQUENCY, MEGACYCLES	R-F AMPLIFIER TUNING POSITION	FIRST I-F AMPLIFIER TUNING POSITION	SECOND OSCILLATOR CRYSTAL FREQUENCY, MEGACYCLES
406	6	6	58.6
407	7	7	59.6
408	8	8	60.6
409	9	9	61.6
410	10	10	62.6
411	11	11	63.6
412	12	12	64.6
413	13	13	65.6
414	14	14	66.6
415	15	15	67.6
416	16	16	68.6
417	17	17	69.6
418	18	18	70.6
419	19	19	71.6
420	20	20	72.6

THEORY OF OPERATION

Same as for Radio Receiver R-425A/ARW-59 except as follows:

Change figure 4-17 by adding resistor R-516 in the plate circuit of the second d-c amplifier tube V-503 (see figure 8-1).

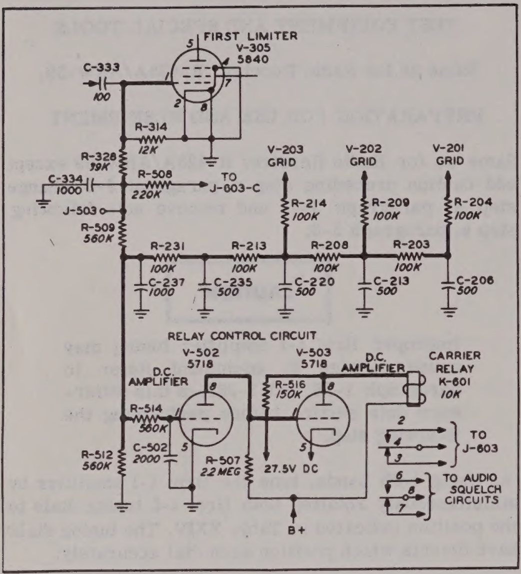

FIRST LIMITER
V-305
5840
C-333
100
R-314
12K
R-328
39K
C-334
1000
R-508
220K
TO
J-603-C
J-503
R-509
560K
V-203
GRID
V-202
GRID
V-201
GRID
R-214
100K
R-209
100K
R-204
100K
R-231
100K
R-213
100K
R-208
100K
R-203
100K
C-237
1000
C-235
500
C-220
500
C-213
500
C-206
500
RELAY CONTROL CIRCUIT
V-502
5718
D.C.
AMPLIFIER
V-503
5718
D.C.
AMPLIFIER
CARRIER
RELAY
K-601
10K
R-516
150K
R-514
560K
R-512
560K
C-502
2000
R-507
2.2 MEG
27.5V DC
TO
J-603
TO AUDIO
SQUELCH
CIRCUITS
B+

Figure 8-1. Avc and Relay Control Circuits, Simplified Schematic Diagram

Change paragraph 4-39, second sentence, to read: An input filter consisting of L-606, C-614A, C-616, and C-630 operate in conjunction with C-608 to prevent the dynamotor from reflecting noise back to the aircraft power system.

Change first note following paragraph 4-39 to read: Capacitors C-616 and C-618 were added in Radio Receiver R-425A/ARW-59, and capacitor C-630 was added in Radio Receiver R-425B/ARW-59 to reduce conducted noise and radiated interference.

Add a third note following paragraph 4-39 to read: Choke L-607 and capacitor C-615 were removed; capacitor C-631 and resistor R-610, R-611, and R-612 were added; and capacitor C-617 was relocated for Radio Receiver R-425B/ARW-59. These component changes were made to reduce noise emanating from blower motor B-601.

ORGANIZATIONAL MAINTENANCE

Same as for Radio Receiver R-425A/ARW-59.

FIELD MAINTENANCE

Same as Radio Receiver R-425A/ARW-59 except as follows:

Figure 8-2 is illustrated to physically locate the added resistor (R-516) and capacitor (C-630) in the audio amplifier circuit and plate voltage input filter circuit, respectively.

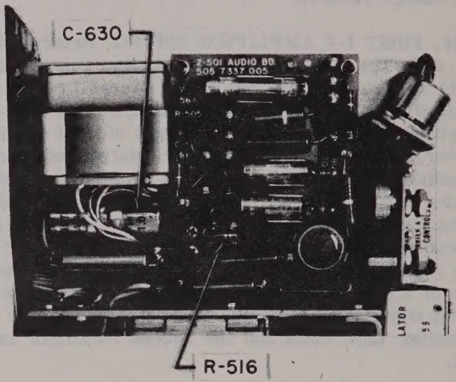

C-630
Z-501 AUDIO BD
R-516

Figure 8-2. Resistor (R-516) and Capacitor (C-630) Location

Change paragraph 6-24, last sentence, to read: A defective filter component (C-614C, C-612, C-613, L-606, C-616, C-614A, C-608, or C-630) may allow the dynamotor noise to be conducted unsuppressed to the receiver circuits.

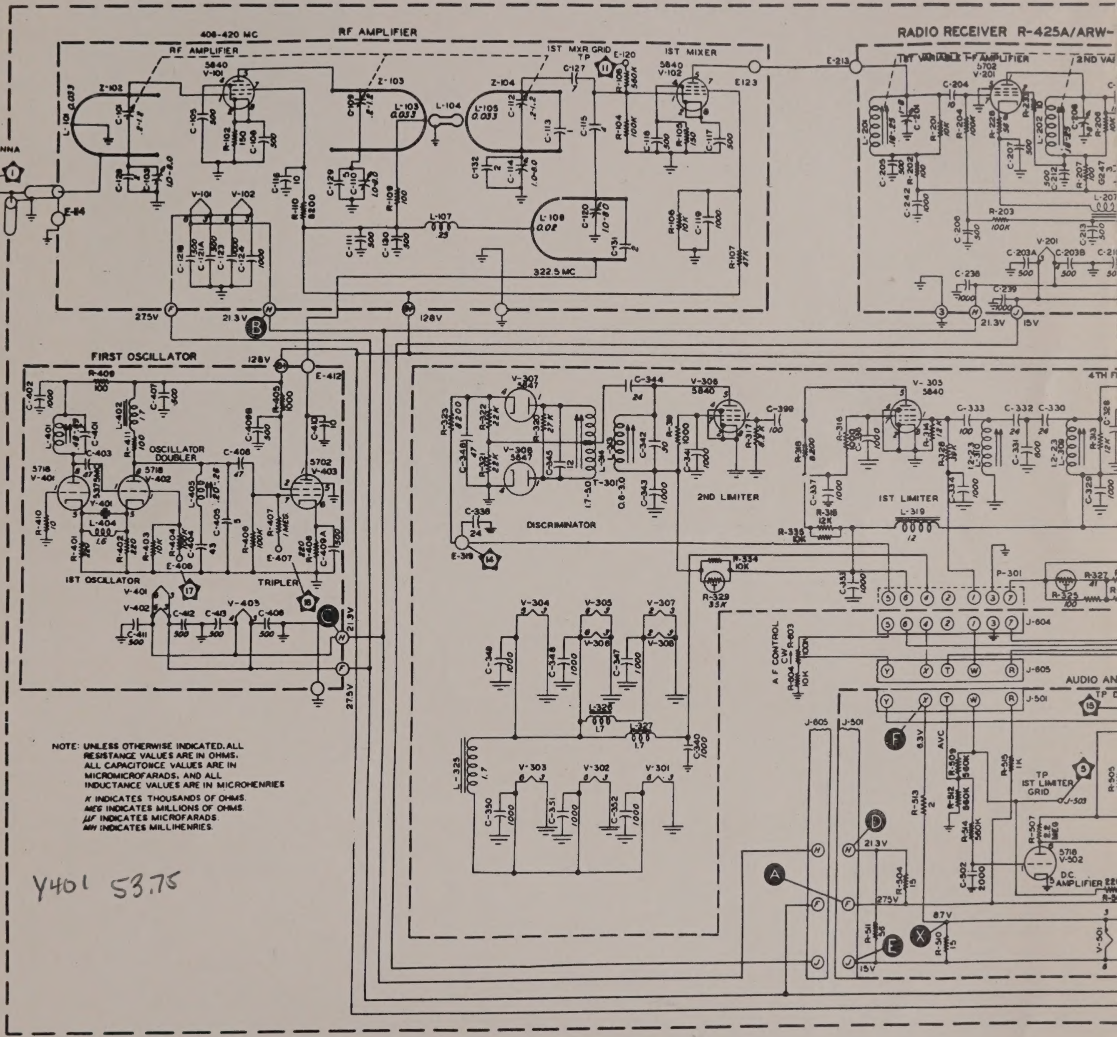
Change paragraph 6-25 to read: BLOWER (B-601). If blower, B-601, is rotating normally and supplying a substantial draft of air, it is operating satisfactory. Defective filter capacitors C-617, C-631, and C-632, or resistors R-610, R-611, and R-612 may allow noise from the blower to reach the receiving circuits.

Add caution note to figure 6-3 and paragraph 6-58 to refer to paragraphs 1-36 and 1-36A of this difference data section before performing first i-f amplifier tuning procedures.

A decal was attached to the first i-f amplifier subassembly (see figure 8-3) to caution the maintenance personnel from performing improper tuning that may result in stretched dial cable, jammed tuners, and detuned high i.f.

DIAGRAMS

Same as Radio Receiver R-425A/ARW-59 except that schematic diagram is as illustrated in figure 8-4 and subassembly interconnection diagram is as illustrated in figure 8-5.


RADIO RECEIVER R-425A/ARW-
408-420 MC
RF AMPLIFIER
1ST MXR GRID TP
1ST MIXER
1ST VARIABLE I-F AMPLIFIER
2ND VAR
ANTENNA
J-801
W-801
E-84
Z-102
Z-103
Z-104
V-101
5840
V-102
5840
L-101 0.033
L-103 0.033
L-104
L-105 0.033
L-107 25
L-108 0.02
322.5 MC
E-120
E123
E-213
5702
V-201
275V
21.3V
128V
15V
FIRST OSCILLATOR
OSCILLATOR DOUBLER
1ST OSCILLATOR
TRIPLER
5718 V-401
5718 V-402
5702 V-403
E-412
E-406
E-407
21.3V
27.5V
DISCRIMINATOR
V-307 5847
V-308 5847
T-301
2ND LIMITER
V-306 5840
1ST LIMITER
V-305 5840
4TH I
L-319 12
E-319
R-334 10K
R-329 33K
P-301
J-604
J-605
J-501
A F CONTROL
CW
AUDIO AN
AVC
TP 1ST LIMITER GRID
J-503
5718 V-502
D.C. AMPLIFIER
87V
6.3V
V-304
V-305
V-307
V-306
V-308
V-303
V-302
V-301
L-326 1.7
L-327 1.7
L-325 1.7

NOTE: UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITONCE VALUES ARE IN MICROMICROFARADS, AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES

K INDICATES THOUSANDS OF OHMS.
MEG INDICATES MILLIONS OF OHMS.
μF INDICATES MICROFARADS.
MH INDICATES MILLIHENRIES.

Y401 53.75

THEORY OF OPERATION

Same as for Radio Receiver R-425A/ARW-59 except as follows:

Change figure 4-17 by adding resistor R-516 in the plate circuit of the second d-c amplifier tube V-503 (see figure 8-1).

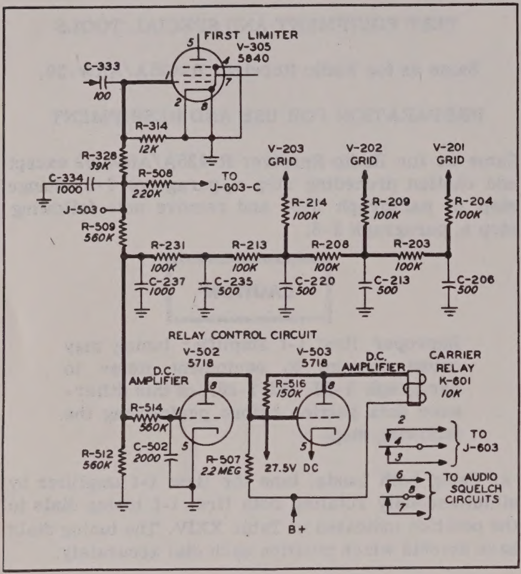

FIRST LIMITER
V-305
5840
5
1
2
8
4
7
C-333
100
R-314
12K
R-328
39K
C-334
1000
R-508
220K
TO
J-603-C
J-503
R-509
560K
V-203
GRID
V-202
GRID
V-201
GRID
R-214
100K
R-209
100K
R-204
100K
R-231
100K
R-213
100K
R-208
100K
R-203
100K
C-237
1000
C-235
500
C-220
500
C-213
500
C-206
500
RELAY CONTROL CIRCUIT
V-502
5718
D.C.
AMPLIFIER
V-503
5718
D.C.
AMPLIFIER
CARRIER
RELAY
K-601
10K
R-516
150K
R-514
560K
R-512
560K
C-502
2000
R-507
2.2 MEG
27.5V DC
B+
2
4
3
TO
J-603
6
8
7
TO AUDIO
SQUELCH
CIRCUITS

Figure 8-1. Avc and Relay Control Circuits, Simplified Schematic Diagram

Change paragraph 4-39, second sentence, to read: An input filter consisting of L-606, C-614A, C-616, and C-630 operate in conjunction with C-608 to prevent the dynamotor from reflecting noise back to the aircraft power system.

Change first note following paragraph 4-39 to read: Capacitors C-616 and C-618 were added in Radio Receiver R-425A/ARW-59, and capacitor C-630 was added in Radio Receiver R-425B/ARW-59 to reduce conducted noise and radiated interference.

Add a third note following paragraph 4-39 to read: Choke L-607 and capacitor C-615 were removed; capacitor C-631 and resistor R-610, R-611, and R-612 were added; and capacitor C-617 was relocated for Radio Receiver R-425B/ARW-59. These component changes were made to reduce noise emanating from blower motor B-601.

ORGANIZATIONAL MAINTENANCE

Same as for Radio Receiver R-425A/ARW-59.

FIELD MAINTENANCE

Same as Radio Receiver R-425A/ARW-59 except as follows:

Figure 8-2 is illustrated to physically locate the added resistor (R-516) and capacitor (C-630) in the audio amplifier circuit and plate voltage input filter circuit, respectively.

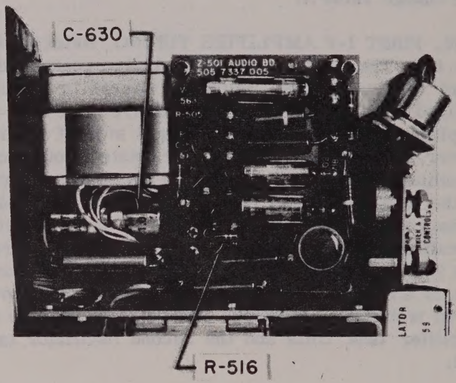

C-630
Z-501 AUDIO BD.
505 7337 005
R-516

Figure 8-2. Resistor (R-516) and Capacitor (C-630) Location

Change paragraph 6-24, last sentence, to read: A defective filter component (C-614C, C-612, C-613, L-606, C-616, C-614A, C-608, or C-630) may allow the dynamotor noise to be conducted unsuppressed to the receiver circuits.

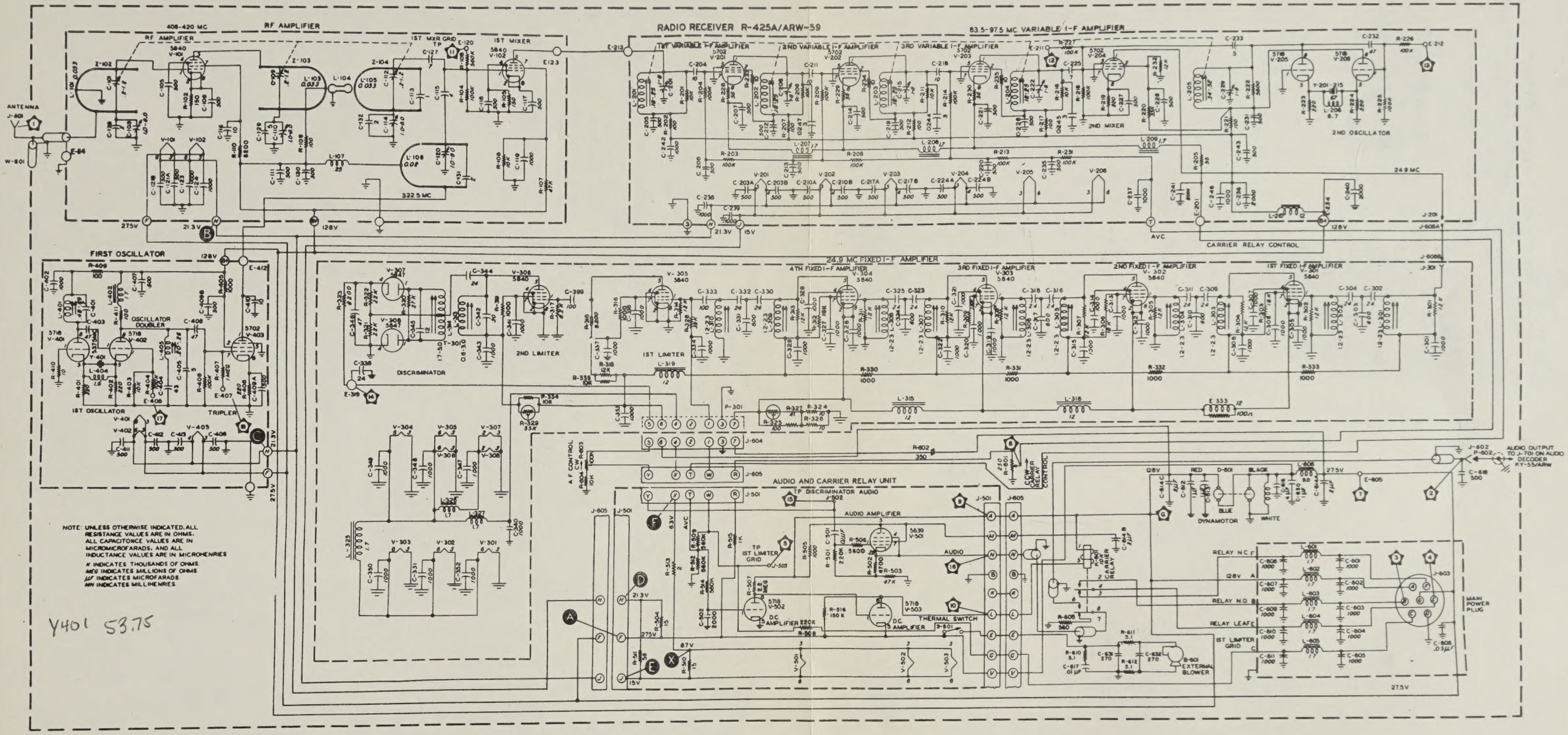
Change paragraph 6-25 to read: BLOWER (B-601). If blower, B-601, is rotating normally and supplying a substantial draft of air, it is operating satisfactory. Defective filter capacitors C-617, C-631, and C-632, or resistors R-610, R-611, and R-612 may allow noise from the blower to reach the receiving circuits.

Add caution note to figure 6-3 and paragraph 6-58 to refer to paragraphs 1-36 and 1-36A of this difference data section before performing first i-f amplifier tuning procedures.

A decal was attached to the first i-f amplifier subassembly (see figure 8-3) to caution the maintenance personnel from performing improper tuning that may result in stretched dial cable, jammed tuners, and detuned high i.f.

DIAGRAMS

Same as Radio Receiver R-425A/ARW-59 except that schematic diagram is as illustrated in figure 8-4 and subassembly interconnection diagram is as illustrated in figure 8-5.


RADIO RECEIVER R-425A/ARW-59
408-420 MC
RF AMPLIFIER
1ST MIXER
1ST MXR GRID TP
ANTENNA
J-801
W-801
E-84
322.5 MC
275V
21.3V
128V
83.5-97.5 MC VARIABLE I-F AMPLIFIER
1ST VARIABLE I-F AMPLIFIER
2ND VARIABLE I-F AMPLIFIER
3RD VARIABLE I-F AMPLIFIER
2ND MIXER
2ND OSCILLATOR
24.9 MC
AVC
CARRIER RELAY CONTROL
15V
FIRST OSCILLATOR
OSCILLATOR DOUBLER
1ST OSCILLATOR
TRIPLER
24.9 MC FIXED I-F AMPLIFIER
4TH FIXED I-F AMPLIFIER
3RD FIXED I-F AMPLIFIER
2ND FIXED I-F AMPLIFIER
1ST FIXED I-F AMPLIFIER
2ND LIMITER
1ST LIMITER
DISCRIMINATOR
A F CONTROL
AUDIO AND CARRIER RELAY UNIT
TP DISCRIMINATOR AUDIO
AUDIO AMPLIFIER
TP 1ST LIMITER GRID
AUDIO
DC AMPLIFIER
THERMAL SWITCH
CARRIER RELAY
CCW CARRIER RELAY CONTROL
DYNAMOTOR
RED
BLACK
BLUE
WHITE
RELAY N.C.
RELAY N.O.
RELAY LEAF
1ST LIMITER GRID
EXTERNAL BLOWER
MAIN POWER PLUG
J-803
J-802
P-802
AUDIO OUTPUT TO J-701 ON AUDIO DECODER KY-55/ARW
A
B
C
D
E
F
X

NOTE: UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS. ALL CAPACITONCE VALUES ARE IN MICROMICROFARADS. AND ALL INDUCTANCE VALUES ARE IN MICROHENRIES

K INDICATES THOUSANDS OF OHMS.
MEG INDICATES MILLIONS OF OHMS.
μf INDICATES MICROFARADS.
MH INDICATES MILLIHENRIES.

Y401 53.75

Figure 8-4. Radio Receiver R-425B/ARW-59, Schematic Diagram

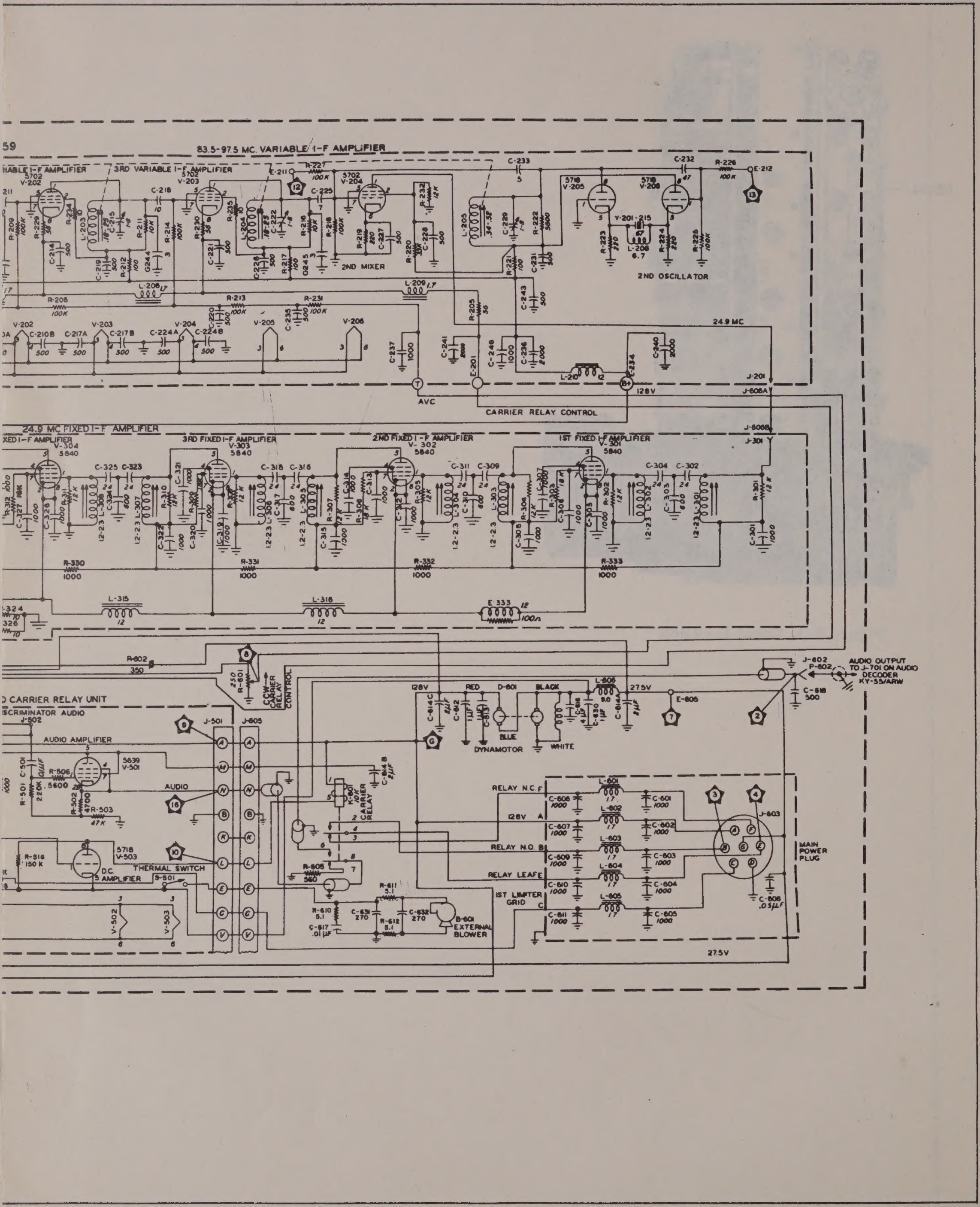

83.5-97.5 MC. VARIABLE I-F AMPLIFIER
3RD VARIABLE I-F AMPLIFIER
V-202
V-203
V-204
5702
2ND MIXER
V-205
V-206
5718
Y-201-215
2ND OSCILLATOR
24.9 MC
E-212
E-211
E-201
E-234
L-210
J-201
J-606A
AVC
CARRIER RELAY CONTROL
128V
24.9 MC FIXED I-F AMPLIFIER
3RD FIXED I-F AMPLIFIER
2ND FIXED I-F AMPLIFIER
1ST FIXED I-F AMPLIFIER
V-304
V-303
V-302
V-301
5840
J-606B
J-301
L-315
L-316
E-333
R-330
R-331
R-332
R-333
1000
R-602
350
R-601
CCW-CARRIER RELAY CONTROL
CARRIER RELAY UNIT
DISCRIMINATOR AUDIO
J-602
AUDIO AMPLIFIER
5639
V-501
AUDIO
5718
V-503
D.C. AMPLIFIER
THERMAL SWITCH
S-501
J-501
J-605
K-601
CARRIER RELAY
R-605
360
R-611
R-610
R-612
5.1
C-617
C-631
C-632
270
B-601
EXTERNAL BLOWER
V-502
V-503
128V
RED
D-601
BLACK
BLUE
DYNAMOTOR
WHITE
L-606
27.5V
E-605
J-602
P-602
AUDIO OUTPUT TO J-701 ON AUDIO DECODER KY-55/ARW
C-618
500
RELAY N.C. F
128V A
RELAY N.O. B
RELAY LEAF E
1ST LIMITER GRID C
L-601
L-602
L-603
L-604
L-605
C-601
C-602
C-603
C-604
C-605
C-606
C-607
C-608
C-609
C-610
C-611
J-603
MAIN POWER PLUG
C-606 .05μF
27.5V

Figure 8-4. Radio Receiver R-425B/ARW-59, Schematic Diagram

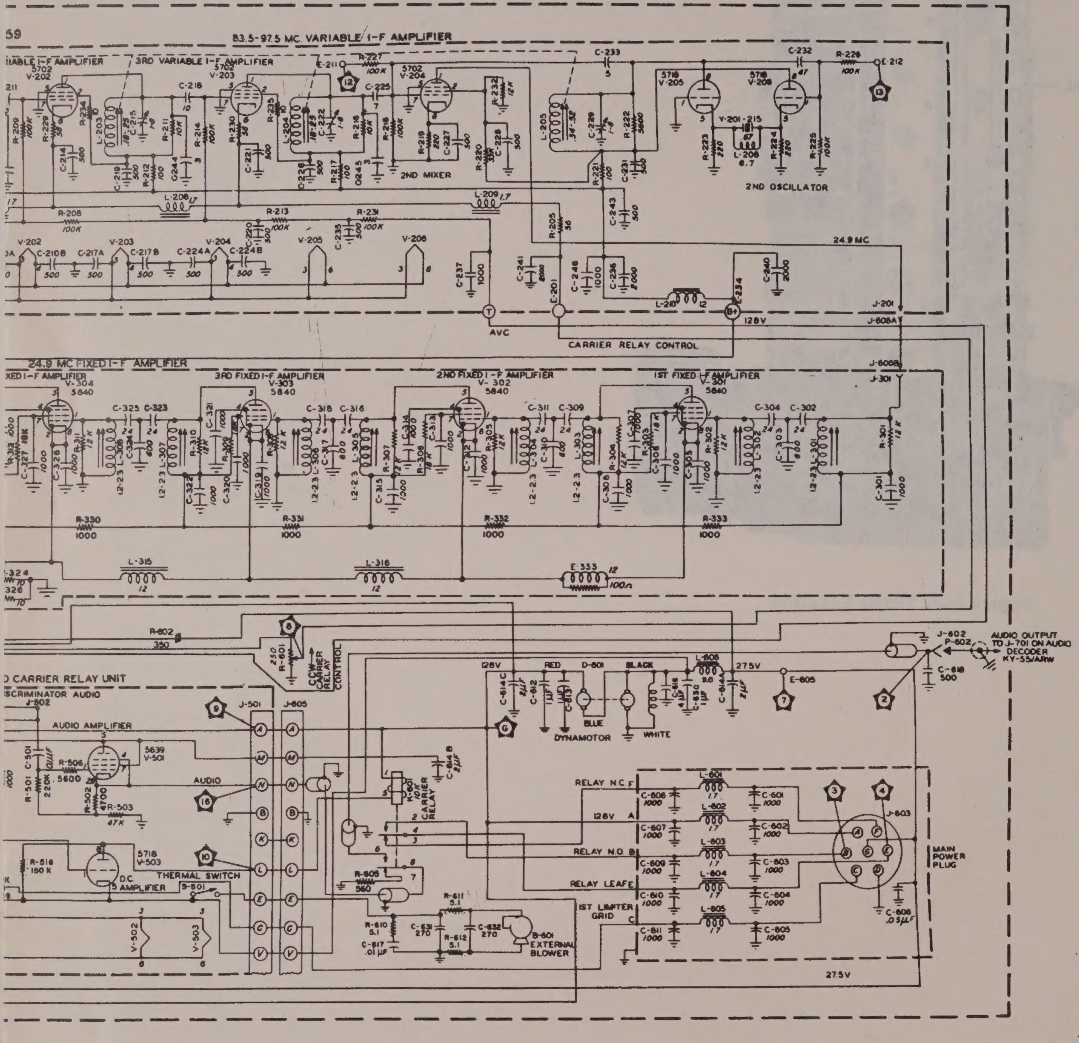

83.5-97.5 MC. VARIABLE I-F AMPLIFIER
3RD VARIABLE I-F AMPLIFIER
5702
V-203
5702
V-204
2ND MIXER
5718
V-205
5718
V-206
V-201-215
2ND OSCILLATOR
24.9 MC
J-201
J-608A
AVC
CARRIER RELAY CONTROL
128V
24.9 MC FIXED I-F AMPLIFIER
3RD FIXED I-F AMPLIFIER
V-303
5840
2ND FIXED I-F AMPLIFIER
V-302
5840
1ST FIXED I-F AMPLIFIER
V-301
5840
J-608B
J-301
CARRIER RELAY UNIT
DISCRIMINATOR AUDIO
AUDIO AMPLIFIER
5639
V-501
AUDIO
5718
V-503
D.C. AMPLIFIER
THERMAL SWITCH
S-501
J-501
J-605
CCW-CARRIER RELAY CONTROL
R-602
350
DYNAMOTOR
D-601
RED
BLACK
BLUE
WHITE
27.5V
E-605
J-602
P-602
AUDIO OUTPUT TO J-701 ON AUDIO DECODER KY-55/ARW
K-601
CARRIER RELAY
RELAY N.C.
128V
RELAY N.O.
RELAY LEAF
1ST LIMITER GRID
B-601
EXTERNAL BLOWER
J-603
MAIN POWER PLUG
27.5V

Figure 8-4. Radio Receiver R-425B/ARW-59, Schematic Diagram

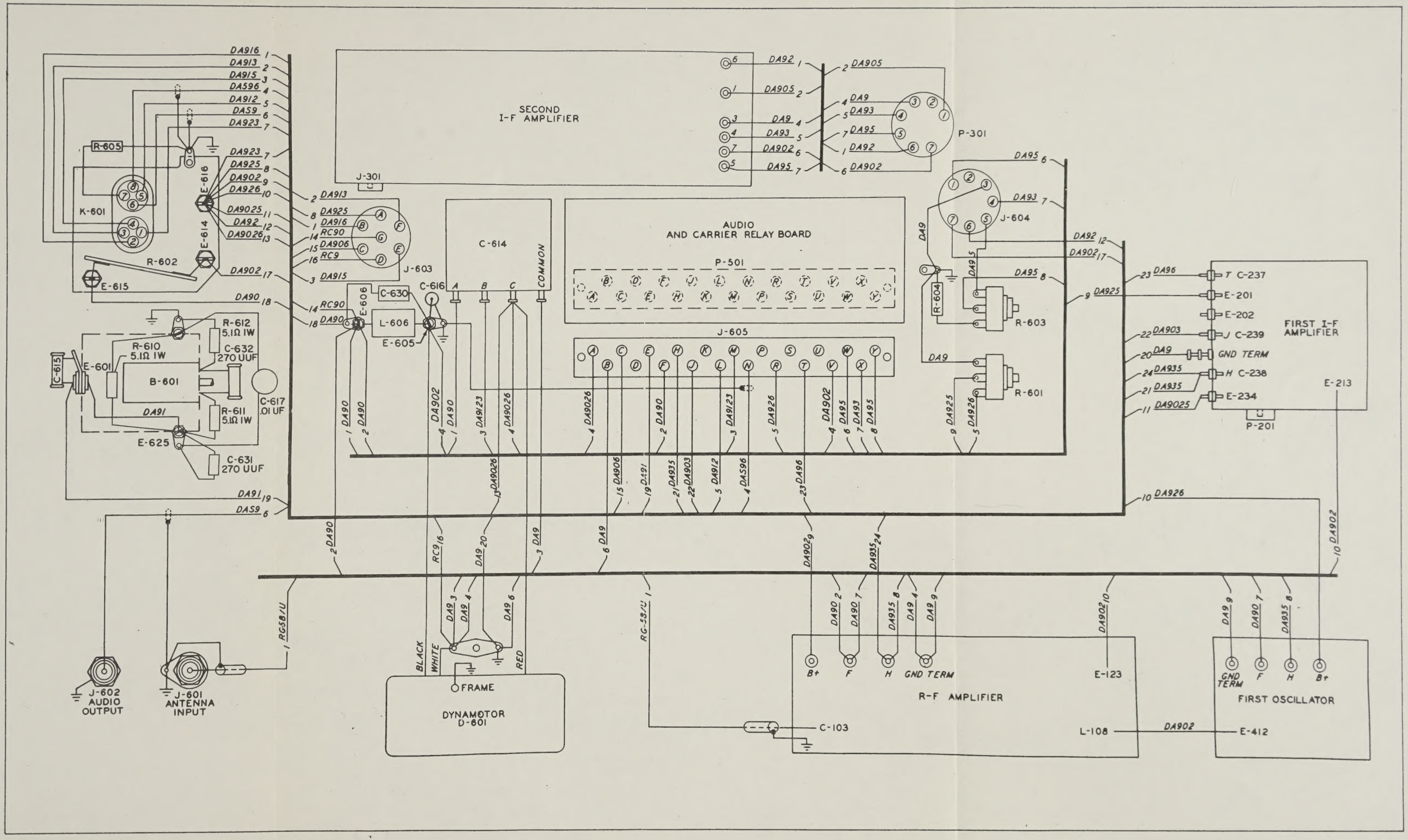

SECOND I-F AMPLIFIER
J-301
P-301
AUDIO AND CARRIER RELAY BOARD
P-501
J-605
C-614
COMMON
K-601
R-605
R-602
E-615
E-616
E-614
J-603
C-630
C-616
E-606
L-606
E-605
R-612 5.1Ω 1W
R-610 5.1Ω 1W
C-632 270 UUF
C-615
E-601
B-601
C-617 .01 UF
R-611 5.1Ω 1W
E-625
C-631 270 UUF
J-604
R-604
R-603
R-601
FIRST I-F AMPLIFIER
T C-237
E-201
E-202
J C-239
GND TERM
H C-238
E-234
E-213
P-201
J-602 AUDIO OUTPUT
J-601 ANTENNA INPUT
RG58/U
RG-58/U
BLACK
WHITE
RED
FRAME
DYNAMOTOR D-601
B+
F
H
GND TERM
R-F AMPLIFIER
E-123
C-103
L-108
DA902
E-412
FIRST OSCILLATOR
DA916
DA913
DA915
DA596
DA912
DA59
DA923
DA925
DA902
DA926
DA9025
DA92
DA9026
DA90
DA91
DA905
DA9
DA93
DA95
RC90
DA906
RC9
DA96
DA903
DA935
DA9123
DA926
DA902

Figure 8-5. Radio Receiver R-425B/ARW-59, Subassembly Interconnection Diagram

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